CITY OF CORVALLIS
CLIMATE ACTION TASK FORCE
AGENDA

Wednesday, June 10, 2015
6:00-8:00 p.m.
Fire Main Meeting Room
400 NW Harrison Boulevard

I.	Call Meeting to Order, Welcome, Introductions	Chair Baker
II.	Review of Ground Rules and Meeting Procedures	Staff
III.	Climate Action Task Force (CATF) Background a. Georgetown University Energy Prize b. Community Proposed Climate Action Plan Draft c. Corvallis 2012 Community Greenhouse Gas Inventory	Staff
IV.	Schedule Meetings	Task Force
V.	Visitor Comments	
VI.	Adjourn	

Task Force Members

Zachariah Baker, Chair
Penny York
Roen Hogg
Kirk Bailey
Cindy Dahl
Marjorie Stevens
Brandon Trelstad

Climate Action Goal

Over the next two years, take bold action to address climate change by (1) supporting the energy conservation efforts of the Corvallis Georgetown University Energy Prize team, and (2) adopting and beginning to implement a comprehensive long-term climate action plan that will significantly reduce Corvallis' greenhouse gas emissions and foster Corvallis' resilience to the effects of climate change.

RESOLUTION 2015-_____

A RESOLUTION CREATING FOUR TASK FORCES TO WORK ON IMPLEMENTATION OF THE 2015-2016 CITY COUNCIL GOALS, CLARIFYING THAT AT LEAST TWO OF THE FOUR COMMUNITY MEMBERS OF THE HOUSING DEVELOPMENT TASK FORCE SHALL BE REPRESENTATIVES FORM THE CITY'S HOUSING AND COMMUNITY DEVELOPMENT ADVISORY BOARD AND RESCINDING RESOLUTION 2015-10.

Minutes of the May 4, 2015 Corvallis City Council meeting, continued.

A resolution submitted by Councilor _____

WHEREAS, Resolution 2015-10 establishing four task forces to work on implementation of Council goals did not specify that at least two of the four community members of the Housing Development Task Force shall be representatives from the City's Housing and Community Development Advisory Board; and

WHEREAS, this resolution rescinds Resolution 2015-10; and

WHEREAS, the City Council has adopted six goals to be completed during the 2015-2016 term; and

WHEREAS, four of these goals will require significant community input and discussion; and

WHEREAS, the City Council has determined that the best method to implement these four goals is to appoint a task force to lead the work for each goal; and

WHEREAS, the important policy decisions will be made as a result of the task forces' work and having City Councilors involved on each task force is important for communication and continuity of decision making;

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF CORVALLIS RESOLVES to create the following task forces:

Sustainable Budget Task Force

Goal: The Council will continue to manage a long-term sustainable budget including the consideration of possible new or expanded revenue sources. An inventory of known infrastructure and unmet program needs, including public safety, will be compiled and prioritized by December of 2015. By September 2015, possible new or expanded revenue sources will be identified that could fund these program and infrastructure needs. By September 2016 the Council will create and begin implementing a long-term revenue plan.

Members: Three members of the City Council's Administrative Services Committee and four citizen members of the Budget Commission.

Charge: Draft and propose for City Council approval the scope, process and timeline necessary to achieve the goal. Identify opportunities and mechanisms for community member involvement, and the best methods for communicating task force work status with the City Council.

Housing Development Task Force

Goal: The city will analyze policy and programmatic tools suggested by the 2014 ECONorthwest Housing Policy Options Study, including funding/resource requirements, and by December 2016, select and implement strategies to facilitate creation of additional transitional, low-income, and workforce housing. In addition, the City will develop strategies to sustain or increase service levels in order to continue the programs currently in place to build and maintain affordable housing.

Members: Three members of the City Council's Human Services Committee and four community members with at least two representing the City's Housing and Community Development Advisory Board.

Charge: Draft and propose for City Council approval the scope, process and timeline necessary to achieve the goal. Identify opportunities and mechanisms for community member involvement, and the best methods for communicating task force work status with the City Council.

Climate Action Task Force

Goal: Over the next two years, take bold action to address climate change by (1) supporting the energy conservation efforts of the Corvallis Georgetown University Energy Prize team, and (2) adopting and beginning to implement a comprehensive, long-term climate action plan that will significantly reduce Corvallis' greenhouse gas emissions and foster Corvallis' resilience to the effects of climate change.

Members: Three members of the City Council's Urban Services Committee and four community members.

Charge: Draft and propose for City Council approval the scope, process and timeline necessary to achieve the goal. Identify opportunities and mechanisms for community member involvement, and the best methods for communicating task force work status with the City Council.

Vision and Action Plan for Corvallis Task Force

Goal: Using an engaged community process, create a new Corvallis Vision and Action Plan 2040 by December 2016. The resulting plan will include an aspirational vision,

an action plan for the City and community partners that is achievable and measureable using a livability index, and a method for regular evaluation and necessary revision. The vision and action plan will be the foundation for necessary work on other City plans.

Members: Three members of the City Council with one representing each of the Council's three standing committees and four community members.

Charge: Draft and propose for City Council approval the scope, process and timeline necessary to achieve the goal. Identify opportunities and mechanisms for community member involvement, and the best methods for communicating task force work status with the City Council.

BE IT FURTHER RESOLVED that the Mayor shall appoint members to each task force and shall identify one of the City Council members to be the Chair of each Task Force; and

BE IT FURTHER RESOLVED that each task force meeting shall be a public meeting, scheduled on the City's meeting calendar; notification lists will be made available for community members to sign-up and receive packets; and minutes summarizing the discussion will be available for public viewing and shared in City Council packets. Each Task Force shall determine at its first meeting how it will manage visitor propositions for each meeting.

_____

Councilor

Upon motion duly made and seconded, the foregoing resolution was adopted, and the Mayor thereupon declared said resolution to be adopted.

City of Corvallis
Climate Action Task Force
Sample Ground Rules
June 2015

Meeting Time

- We will start and end the meeting on time.

Attendance

- Because decisions made will be based on information shared and discussions held at previous meetings, we agree that regular attendance is critical to the success of the project.
- We will notify Public Works staff and the Chair if we are unable to attend a meeting.

Member Expectations

- We will come to the meeting prepared to discuss agenda items, having read the materials in advance.
- We will not bring our cell phones to the meeting, or we will set them to vibrate. If we get a call during the meeting that we must take, we will leave the meeting room to do so.
- We will treat everyone with respect.
- We will not speak on behalf of or attempt to characterize how the full group feels about any particular issue of the CATF when speaking with media contacts.

Topic Discussions

- We will be active participants in the discussion.
- We will be honest and open-minded, and state issues clearly and early in the process. We encourage expression of different points of view.
- We will wait to speak until recognized by the meeting leader.
- We will listen carefully with the intent of understanding and let others finish before speaking.
- We will focus questions and comments on the subject at hand and stick to the agenda.
- We will collaborate with other members and seek to find common ground; looking for the big picture and the community-wide interests.
- We will make timely decisions and move on to the next step.
- We will work towards consensus on all major decisions/recommendations. Consensus means support for the recommendation as the most viable decision for the group as a whole although it may not be an individual's personal favorite.

Violation of Ground Rules

- We will confront other members in a supportive manner when they unknowingly violate the ground rules.

Public Participation at Meetings

- There will be designated times for public participation in each meeting which will be identified on the meeting agenda. Written input can be provided to City staff at any time for inclusion in the public record of the CATF.
  Email address: Public.Works@CorvallisOregon.gov

- Members of the public will sign in before presenting to the Task Force.

City of Corvallis
Climate Action Task Force
Meeting Procedures
June 2015

The following are topic areas for the Task Force members to discuss and reach consensus on related to meeting procedures. After each topic heading is a recommendation from staff as a starting point for the conversation.

Meeting time

Determined by Task Force

Meeting length

Recommend two-hour maximum

Meeting location

Determined, based on availability, once meeting time is established

Meeting leader

Recommend Chair lead the meetings

Meeting minutes

Recommend summary minutes that capture the general discussion with decisions/ recommendations noted

Task Force decisions

Recommend using a consensus approach; if not possible, then majority

Task Force requests for information from staff

Recommend that the group reach consensus on whether the information is beneficial to moving a discussion or decision point forward

Public input

Recommend time at the beginning and end of each meeting for public input
Recommend using special meetings devoted to public input when needed
Recommend a five minute time limit on an individual's presentation

Oregon Public Meeting Law

The Oregon Public Meeting Law generally requires that all public body meetings be open to the public. Formation of sub-committees is permitted, and because a quorum of the Task Force is not present, these meetings do not have to be open to the public. However, decisions can only be made during meetings of the full Task Force that are open to the public.

All electronic communications among Task Force members and from the public to a Task Force member are open to Oregon Public Meeting Law inquiries and public records requests. All communications from one Task Force member to all others will be provided to staff, as will all communications from the public to individual Task Force members for inclusion in the public record of the Task Force.

Corvallis City Council Goal Proposal
Submitted by the Corvallis Georgetown University Energy Prize Steering Committee
January 12, 2015

The Georgetown University Energy Prize (GUEP) is a five million dollar competition that is challenging small- to medium-size cities to work with their local governments, residents, and utilities to achieve innovative, replicable reductions to gas and electricity use. Corvallis has been selected as one of 50 cities to advance to the Semifinal round of the competition. With over 70 communities participating in the application and Quarterfinalist rounds during 2014, the field has been narrowed to a group of select cities that will compete through 2016 to reduce their energy consumption and are vying to make it into the Finalist round in 2017.

The Corvallis application has been managed by the GUEP Steering Committee, which is a group of volunteers from Energize Corvallis (a program of the Corvallis Environmental Center) and the Corvallis Sustainability Coalition's Energy Action Team. In 2014 the GUEP effort received letters of support from former Mayor, Julie Manning; former City Council President, Richard Hervey, who submitted a letter expressing support on behalf of the entire Corvallis City Council; and from 15 organizations representing non-profits, businesses, faith communities, Oregon State University, and the Department of Public Works.

The Steering Committee proposes that the City Council adopt a goal to support the energy-conservation strategies in the Corvallis Program Plan for the Georgetown University Energy Prize, including the following:

1. **Support efforts to win the Energy Prize by allocating staff time to collaborate on GUEP efforts. (Throughout 2015 and 2016)** To win the competition, GUEP staff and volunteers will need to collaborate with Corvallis City staff. For example, Scott Dybvad, Sustainability Program Specialist, can provide expertise in greenhouse gas emissions and outreach; and Adam Steele, Franchise Utility Specialist, can provide valuable input on utility partnerships and municipal energy-conversation projects.
2. **Provide $5,000 toward a GUEP Program Coordinator salary. (Within three months)** The Program Coordinator will implement the strategies outlined in the Corvallis GEUP Program Plan (summarized below). The programs will reduce 10,000 metric tons of carbon dioxide annually, which is equivalent to taking 2,100 cars off the road every year. The Program Coordinator will be hired and managed by the Corvallis Environmental Center, which has already raised $5,000 toward funding the position and has submitted three grant proposals for additional funding.
3. **Choose a municipal energy-saving project to complete in 2016. (Within eight months)** Reducing municipal energy use is an important component of the GUEP. The GUEP Steering Committee will collaborate with the City Council to identify 3-4 municipal energy-saving projects, and the City Council will select a project to complete in 2016 (e.g., community-supported solar, a net-zero municipal facility).

This goal gives City Council the opportunity to show national leadership in climate action, can be completed during the 2015-2016 term, is quantifiable, supports the strategies in the "Building and Energy" section of the Climate Action Plan, and can provide an ongoing boost to our local economy. Every Corvallis resident who saves money on his or her utility bill will have extra money to spend locally.

Corvallis Georgetown University Energy Program Plan Summary

During GUEP competition, we will encourage every household in Corvallis to reduce their energy use by 10%, 20%, 50%, or 100% (net-zero) by focusing on four strategic areas:

1) **Promoting the current "Communities Take Charge" website,** which allows residents to select energy-saving actions to try each month and incentivizes participation by rewarding Energy Prize Points. (EnergizeCorvallis.org/TakeCharge)
2) **Creating an ongoing outreach campaign** including tabling at events, door-to-door canvassing, talks at local meetings and gatherings, social media, emails to partner organizations, and through earned and purchased media.
3) **Leveraging existing partnerships and programs** by highlighting them in our outreach material. We will also feature a quarterly energy-saving program (e.g., a "Baseboard Buyback" campaign with a bulk-purchasing offer on ductless heat pumps).
4) **Cultivating new partnerships and programs** by identify demographic sectors that do not yet have access to efficiency upgrades or financing and create resources and programs for those sectors. For example, it is extremely difficult for residents of historic homes to get a permit to install solar electric, so we will work with the permitting office to develop a streamlined process.

Program Goals: The Corvallis GUEP program goals include the following targets for outreach and energy reduction:

- 100% of households (21,000 households) receive at least one invitation to participate in the program
- 20% of households (4,200 households) receive programmatic information quarterly
- 10% of households (2,100 household) take actions to reduce their energy use by 10%
- 3% of households (630 households) take actions to reduce their energy use by 20%
- 2% of households (420 households) take actions to reduce their energy use by 50%
- 1% of households (210 households) take actions to reduce their energy use by 100%
- 5% reduction in Corvallis electric and natural gas use

For More Information:
To see the complete Corvallis GUEP Program Plan, please visit EnergizeCorvallis.org or contact Carly Lettero, Energize Corvallis Director, Corvallis Environmental Center. (Carly@CorvallisEnvironmentalCenter.org / 541-758-6198)

Corvallis Environmental Center

CORVALLIS

Program Plan, Corvallis, Oregon

Georgetown University Energy Prize, Stage 2

Steering Committee: Tom Ekstedt, John Friedlander, Carly Lettero, Cassandra Robertson

Contact Information: Carly Lettero, Energize Corvallis Director, Corvallis Environmental Center, Carly@CorvallisEnvironmentalCenter.org, 541-758-6198

NOVEMBER 10, 2014

Corvallis Environmental Center

CORVALLIS

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A. Program Management and Partners

A.1

Leadership: The program will be led by Corvallis community members who will serve on the Steering Committee, Advisory Council, Stakeholder Representative Team, and Working Groups, as described below:

Steering Committee – The Steering Committee will oversee the implementation of the Program Plan. The current GUEP Steering Committee developed in collaboration with volunteers from two groups:

1) Energize Corvallis, a program of Corvallis Environmental Center, a non-profit dedicated to educating, engaging and inspiring people to create a healthy, sustainable community.
2) The Energy Action Team, which is one of 12 action teams of the Corvallis Sustainability Coalition—a network of organizations and individual volunteers in Corvallis who are working together to create a sustainable community.

In Stage 3 of the competition, the Steering Committee will expand to include additional community members.

Advisory Council – The Steering Committee will invite political and business leaders to become members of the Advisory Council. The Council will meet quarterly, and members will serve as ambassadors for the program. They will guide strategic decisions, work to overcome political and organizational barriers, and build relationships with partner organizations.

Stakeholder Representatives – The Steering Committee will invite community members from neighborhood associations, faith communities, civic organizations, local schools and businesses, non-profits, and the Corvallis Sustainability Coalition network to become Stakeholder Representatives. These representatives will serve as community liaisons during the GUEP competition and help guide the development and implementation of the Program Plan.

Working Groups – The Steering Committee will invite community members to serve on short-term working groups as necessary. For example, we currently have two energy working groups. The Energy Profile Working Group is focused on acquiring energy data for Corvallis. Our Energy Program Working group is analyzing and exploring new energy efficiency and conservation programs for Corvallis. Future working groups may include public outreach and communications, split-incentive solutions, and fundraising.

Management: Carly Lettero, Energize Corvallis Director, will manage the Program Plan. Carly is a community organizer and an interdisciplinary researcher. She has overseen the development of Energize Corvallis programs since 2009 and is leading the regional expansion of successful pilot programs. With over 13 years of program development and management experience for environmental non-profits, Carly will oversee the development

and implementation of the Program Plan including the fundraising campaign, grant writing and reporting, outreach and partnership development, and program evaluation.

A.2

Staffing: We have allocated sufficient staff time to this project and have assembled a team with the necessary expertise to develop, manage, evaluate, and replicate successful programs over the next two years. In addition to the Energize Corvallis Director, the following Energize Corvallis team members will staff the program:

Cassandra Robertson, Environmental Engineer, directed the Corvallis Environmental Center's Resource Efficiency Program. By providing on-site providing on-site energy walk-throughs at commercial facilities, Cassandra identified strategies such as energy efficiency and renewable energy sources to cut operational costs for local businesses. In addition, with funding from the Federal Energy Efficiency Community Block Grant, she directed the Corvallis Weatherization Incentive Program and co-directed the Corvallis Saving Energy Loan Fund, which providing incentives and loans for residential energy efficiency projects. Cassandra will develop the energy savings and calculation methods used on the program website, help oversee the Program Plan, and establish and evaluate energy-saving goals.

Chrissy Lucas, Program Coordinator, has managed large workshops and conferences for Oregon State University Extensions Small Farms Program. She has played an integral role in developing the volunteer internship program for Energize Corvallis programs. Chrissy will provide program support by coordinating program events, volunteer days, and partner relationships.

Travis Burnside, Software Developer, has 20 years of software development experience and expertise in writing scalable systems in a variety of languages. Travis will manage the development of the program website, with a focus on creating an online program that can be scaled up to share with other communities.

Tom Ekstedt, IT Specialist, is an electrical engineer with over 20 years of experience in the IT industry, serving in development, technical leadership, and project management roles. For the past five years, he has been involved with local nonprofit organizations that promote and facilitate energy efficiency and renewable energy throughout the community. Tom will oversee the development and management of the program website and data from utility partners.

Samantha Newton, Graphic Designer, has expertise in graphic design, writing, editing, promoting, advertising, and community outreach. She will develop the website design and program promotional materials including brochures, posters, door hangers, and advertisements.

In addition to the current Energize Corvallis staff mentioned above, we will also create the following three new positions:

GUEP Outreach Coordinator: This position will be responsible for the daily details of the Program Plan such as scheduling committee meetings, assisting with fundraising efforts, coordinating volunteer days, communicating with program partners, recruiting program volunteers, and program reporting.

Communication Coordinator: This position will develop a communication plan for the program, including messaging and an outreach schedule. This position will also manage media relations and help secure in-kind marketing donations (e.g., billboard space, radio ads, etc.).

Community Organizers: These internship positions will work closely with Energize Corvallis staff and will focus on spreading the word about the program. To reach diverse groups in Corvallis, they will use door-to-door canvassing, tabling at community events, social media and community workshops.

Funding: We have developed a two-year program budget of $250,000. Please see Appendix A (Program Budget) for a detailed outline of program income and expenses. We anticipate raising funds in the following ways:

Grants ($110,000): We are developing or have submitted grant proposals for a number of foundations that might be interested in supporting our work including Sparkplug Foundation, Levinson, Compton, Wells Fargo, Sappi, Funders Network Partners, The Sherman Foundation's Core Fund, and the Benton County Cultural Coalition.

Support from local businesses and community organizations ($45,000): During this fundraising campaign, 30 businesses will be invited to contribute $1,000 each toward the operating budget for the program. We will also invite three large businesses to contribute $5,000 each. We will incentivize this support by publicizing the businesses on our website, promotional material, and public events. If Corvallis wins the GUEP prize, we will also offer to reimburse the businesses for their initial contribution.

Donations ($15,000): During this fundraising campaign, we will invite Corvallis residents to support the programs through individual donations. We will incentivize this support by publicizing the names of supporters. And, as with businesses, if Corvallis wins the GUEP prize, we will also offer to reimburse donors for their initial contribution.

In-kind support ($80,000): We anticipate $10,000 of in-kind contributions such as printing and advertising. And we anticipate $30,000 of in-kind support through volunteer hours (1,405 volunteer hours x $21.35/hr). We value volunteer time at $21.35/hour in accordance with the "Independent Sector's Value of Volunteer Time" report for Oregon (Independent Sector 2014).

A.3

Engaging the Community: We will engage community members in two phases:

Phase I: Program Registration – During this phase, we will encourage community members to participate in the program with online registration. We will promote registration through community-wide outreach including emails to list serves, billboards, signs on buses, community events and workshops, radio and newspaper ads, and social media. When community members register, they will commit to reduce their energy use by a certain percentage (10%, 20%, 50% or 100%, as described in detail in the Energy Savings Plan below), and we will collect information about each community member that will help us customize further outreach.

Phase II: Program Participation: Once participants have registered online, we will welcome them to the program with a personalized letter and will continue to engage them in the program. Further contacts will be made, targeting their specific energy-reduction goals and needs. For example, renters will receive information about efficiency programs for renters, such as free light bulbs and weatherization workshops. Property owners will receive information about upgrading their multi-family units, and low-income residents will receive information about financing tools to make upgrades affordable. We will also share inspirational personal stories about residents, neighborhoods, and community groups who have overcome barriers to energy efficiency.

Motivating the Community: We have developed a community engagement framework that builds on ideas from the fields of community organizing and community-based marketing. We will motivate Corvallis residents to participate in the program using public recognition and program points, as described below.

Public Recognition: We will recognize Corvallis residents for their participation in the program on the website, in community window displays, and in program presentations and events.

Program Points: Program participants will gain points by completing specific program activities such as:

- Registering for the program online
- Choosing three actions to try for a month
- Reporting back at the end of the month
- Inviting friends to register for the program
- Attending programmatic events and workshops

Program participants will be able to use their points in three ways:

1. **Coupons for local businesses**: We will invite local businesses to offer coupons in exchange for program points. For example, a participant might be able to use

points to get a free cookie at a local restaurant or 10% off their purchase at a local store.

2. **Donations to local energy-efficiency projects**: Participants will be able to donate their points to help fund local energy-efficiency projects. We will solicit cash donations from businesses or individuals and allocate their donation to a certain projects. For example, if a business donates $5,000 toward a local solar project, they could specify that they will donate the full amount when enough community participants give 5,000 points toward the project. In this way, donations will support local solar and encourage community members to participate in the programs.

3. **Raffle Tickets**: Residents will have the opportunity to use their points for a raffle at the end of the two-year program. If Corvallis wins the GUEP prize, the raffle will include prizes that are funded with a portion of the GUEP prize (e.g., cash, home-energy remodels, energy efficient appliances, etc.). If Corvallis does not win the GUEP prize, the raffle will include prizes that are donated from local businesses (e.g., a bike, a weekend at an Oregon beach house, a free class at the Craft Center).

A.4

We have received letters of support from Corvallis Mayor, Julie Manning, and from Corvallis City Council President, Richard Hervey, who submitted a letter expressing support on behalf of the entire Corvallis City Council. We will build on this support after the November 2014 election by working with the new mayor and incoming city councilors to propose an energy-related City Council Goal for the upcoming, two-year term (2015-2016). If City Council votes to adopt the energy goal, they will allocate city staff time and resources to support it. Furthermore, adoption of the goal will ensure that energy efficiency and conservation are considered in City discussions and policy development.

We will also partner with the City to encourage and promote energy-efficiency programs and projects that are planned for the next two years including the following:

- The adoption and implementation of a **Climate Action Plan** (CAP) is anticipated in 2015. A citizen task force is developing CAP.
- A 208-kilowatt, ground-mounted solar installation at the City's **Public Works Compound** will be completed in December 2014. The project site can accommodate up to two megawatts of photovoltaic modules, and the 208 kW project will provide the needed conduit backbone and hardware to allow for future system expansion with minimal equipment or preparation.
- The installation of a 35kW **micro-hydro generation at Rock Creek** is anticipated to start in 2015 and will produce approximately 175,000 kilowatt-hour (kWh) per year.
- The **replacement of wastewater blowers** with variable speed turbine units will begin in 2015 after the completion of a 2014 study to determine potential energy

savings and cost. The current 75hp motors operate 13,400 hrs/year and are the largest single energy consumer at the Corvallis Wastewater Treatment Plant.

- **Retrofitting lighting** at the Public Library is scheduled to begin in 2015.
- **Replacing illuminated signs** with diamond-grade reflective signs will happen as the illuminated signs fail and will save approximately 27,000 kWh/year.

A.5

Municipal Financing Programs: The City's Housing and Neighborhood Services Division offers two housing rehabilitation loan programs for low- and very-low income homeowners. These loans allow community members to undertake critical, often deferred, home repairs including weatherization upgrades. Loan applications are accepted throughout the year, and are processed as they are received. Currently, City loans are supporting the rehabilitation of more than 100 homes and 600 rental units. The loan programs include:

The Neighborhood Improvement Program offers a no-interest amortized loan to low-income homeowners (between 50% and 80% of the Corvallis median income level) for critical home repairs.

The Essential Repair Program offers no-interest, deferred payment loans that are available to very low-income homeowners (below 50% of the median income level), for critical home repairs.

Local Regulations: In partnership with city officials, we will identify opportunities to advance energy efficiency policies in the short term. And with longer-term goals of efficiency regulations in mind, we will explore the possibility of modifying land-use and development codes (e.g., Property Maintenance Code).

A.6

We anticipate developing a number of ways for businesses to get involved in the program, including the following:

Advisory Council: Business leaders from key sectors (e.g., energy-efficiency and solar sectors) will be invited to serve on the Advisory Council.

Stakeholder Representatives: We will invite businesses and business groups (e.g. Corvallis Independent Business Alliance, Chamber of Commerce) to nominate a Stakeholder Representative who will guide the development and promotion of the program at quarterly gatherings.

Financing Programs: We plan to facilitate new partnerships and build on existing partnerships with our major employers (Oregon State University, Hewlett-Packard, and Good Samaritan Medical Center) and the Clinton Climate Initiative's Home Energy Affordability Loan (HEAL), which a program that assists communities

establish employer-sponsored "energy benefits" that bring energy efficiency and sustainable practices to the workplace.

Program Participation Incentives: To promote local businesses, we will develop avenues for them to advertise their support of their program through sponsorship, donating coupons that participants can earn with program points, and advertising.

Employee Engagement: We will also involve businesses by inviting their employees to participate in the program with online registration at employee meetings, informational outreach, etc.

A.7

Corvallis residents have access to incentive programs, tax credits, and finance programs, each of which is described below:

Incentive Programs

Clean Energy Works (CEW) is Oregon's largest non-profit home performance provider offering a one-stop experience, from the initial home energy review, to finding the right contractors, to securing financing. Energize Corvallis has been partnering with CEW to deliver their services in Benton, Linn, and Lane Counties since 2011.

Community Services Consortium (CSC) provides home weatherization to low-income individuals and families. This not only makes their homes more comfortable, but it reduces their wintertime heating costs through energy efficiency and savings.

Corvallis Toilet Rebate Program is a municipal program for the replacement of existing toilets with EPA WaterSense toilets for Corvallis residents.

Consumers Power Inc. (CPI) is a privately owned nonprofit rural electric cooperative serving 22,000 members in six counties in Oregon (Benton, Lincoln, Lane, Linn, Polk, and Marion). CPI offers a wide range of energy efficiency and rebate programs that customers can take advantage of (e.g. incentives for solar electric systems and ductless heat pumps).

Energize Corvallis Direct Install Program offers free installation of energy-efficient light bulbs and faucet and shower aerators to Corvallis' Pacific Power and NW Natural customers living in single-family homes.

Energy Trust of Oregon is an independent nonprofit organization dedicated to helping utility customers benefit from saving energy and generating renewable power. Energy Trust's services, cash incentives and solutions have helped participating customers of Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas save $1.7 billion on their energy bills. The Corvallis

Environmental Center has been connecting residential and business customers with Energy Trust incentives since 2005. Energy Trust programs include:

- **Savings Within Reach** is an Energy Trust program that offers increased cash incentives to moderate-income households to make energy-efficiency upgrades. Residents work with a participating contractor who installs qualifying improvements with incentives deducted upfront to reduce out-of-pocket costs.

- **Existing Manufactured Home Program** is an Energy Trust program that offers free energy-saving services for residents of manufactured homes. Energy Trust also offers cash-back incentives that are paid directly to the owner of the existing manufactured home or existing manufactured home property manager for water heating, weatherization, and heating.

NW Natural Gas offers seasonal incentives available for natural gas equipment and information on NW Natural Preferred Contractors for installation or service. For instance, in Autumn 2014, if customers use a NW Natural Preferred Contractor, they receive incentives of up to $1,292 when they purchase and install a new high efficiency gas furnace and air conditioner.

Tax Credits

Federal Energy Tax Credits are available for consumer energy efficiency projects.

Residential Energy Tax Credits (RETC) are Oregon state tax credits that are available for residential energy efficiency and renewable energy projects.

Residential Renewable Energy Tax Credits are Federal tax credits that are available for residential solar electric, solar thermal, fuel cell, geothermal heat pump, and small wind installations.

Finance Programs

Seeds for the Sol is a local non-profit promoting solar electric installation and usage. It connects low and middle-income homeowners with local individuals willing to provide no- interest loans for solar electric installations. Once the installation is completed, the homeowners then pay back the loan through state and federal tax credit revenue.

Green Street Lending is a program from Umpqua Bank that provides loan options for homeowners to invest in energy efficiency improvements or renewable energy.

Corvallis City Loan Programs: Please see the "Municipal Financing Programs" section, above, for details on City loan programs for efficiency upgrades.

MPower Oregon offers a simple, integrated solution for lowering energy and water expenses at existing affordable multifamily properties. Through its one-stop shop approach, MPower delivers immediate savings to owners and occupants. MPower provides building upgrades and ongoing technical support services and combines it with an easy repayment plan to make it possible to improve affordability now.

A.8

Citizen Groups: We will involve citizen groups (e.g. neighborhood associations, non-profits, renter associations, student groups, etc.) by inviting each group to nominate a Stakeholder Representative. These representatives will guide the development and promotion of the program at quarterly gatherings.

Major property owners: There are 21,291 households in Corvallis, and the rental rate is 57%, well above the national and Oregon averages of 35% and 38%, respectively.[1] Single-family homes comprise 55% of the housing stock, and multi-unit structures comprise 45% of the housing stock. The high percentage of rental units makes Corvallis an ideal market for developing programs that engage property owners. Like many other communities, a few individuals own the majority of these properties, with a handful of firms managing the remaining properties. Through a series of one-on-one conversations, we will invite major property owners to commit to efficiency upgrades to their properties. Once a major property owner completes efficiency upgrades, we will publicize his or her commitment to energy efficiency to inspire additional property owners to get involved in the program.

A.9

We have received 15 letters of support from organizations, which represent non-profits, businesses, faith communities, Oregon State University, and the Department of Public Works. (Please note that the letters of support were included in our Stage 1 application.) We will invite these organizations to becoming Stakeholder Representatives, and we will continue to develop new partnerships throughout the competition. Our goals for productive partner relationships include building volunteer and programmatic capacity, and broadening access to diverse grant sources. Current support includes letters from:

350Corvallis
Citizens Climate Lobby
Corvallis Climate Action Plan Task Force
Corvallis Environmental Center
Corvallis Independent Business Alliance
Corvallis Sustainability Coalition
Extension Service Benton County
Oregon State University
Farmland LP
First United Methodist Church
League of Women Voters
Marys Peak Group of Sierra Club
Public Works, City of Corvallis
Sustainability Office
Oregon State University
Student Sustainability Initiative
Oregon State University
Unitarian Universalist Fellowship of Corvallis

[1] According to the 2008-2012 Census: http://quickfacts.census.gov/qfd/states/41/4115800.html

B. Energy Savings Plan

B.1

Our program will encourage every household in Corvallis to reduce their energy use by 10%, 20%, 50%, or 100% (net-zero). We'll do this by focusing on four strategic areas: 1) developing a program website 2) creating an ongoing outreach campaign, 3) leveraging existing partnerships and programs, and 4) cultivating new partnerships and programs. Each of these focus areas is described below:

B.1.1 Developing a program website

Over the past four years, we have developed and piloted a website called "Communities Take Charge" in Corvallis. From a list of over 60 energy-saving actions, our website encourages community members to select three to five energy-saving actions to try for one month. Communities Take Charge has proven effective at effective at engaging community members, with over 10% of Corvallis residents, or 6,000 people, participating in the program. Furthermore, it provides valuable data on our community's carbon dioxide reductions. During the 3-year pilot, a total of over 28,500,000 total pounds of CO_2 was saved, with an average participant savings of 5,000 pounds per year. As an added benefit, the website has allowed us to measure our success with long-term change and environmental stewardship. Because of their participation in the program, 68% of participants report that they "definitely will" maintain the changes they made during the program, and 74% report that they "definitely" or "might" get more involved in sustainability.

The online program registration is modeled after an online shopping website: participants browse through categories of actions, fill their shopping cart with the actions they'd like to try, and then "check out" and complete a short pre-survey. After participants register, they receive a series of emails including 1) a welcome email with the list of actions they selected, 2) reminder emails throughout the month with the actions they selected and tips about each action, and 3) one month after they register they receive an email asking them to report on how successful they were at completing their actions and an invitation to select three new actions. After participants complete the exit survey, the online tool automatically calculates the participant's energy savings.

For the Georgetown University Energy Prize, we will modify this existing website to include a number of new features such as inviting program participants to A) set energy-saving goals, B) automatically suggest pathways to energy-reduction based on the participant's goals and demographic information, and C) incentivize participation by rewarding program points. Each of these new features is described below:

A. **Goal setting**: When community members register for the program online, they will be invited to choose an energy-reduction goal for their household of 10%, 20%, 50%, or 100% (net-zero). Once a community member selects their energy-reduction goal, the website will automatically do the following:
   - Suggest a menu of actions and corresponding programs that can help them achieve their goal.
   - Prompt them to select three actions to do in the next four weeks to help them achieve their goal.
   - Send them personalized information about the actions they have selected.
   - Send them weekly email reminders about their actions.
   - Ask them to report back at the end of the month about how successful they were at completing their actions.

B. **Energy-reduction pathways**: We are developing pathways that will provide an opportunity for anyone in Corvallis to achieve their energy-reduction goals, regardless of housing type and socio-economic status. The website will automatically suggest pathways for community members based on four criteria:

   1. The **percentage of energy reduction** they would like to achieve (10%, 20%, 50%, or 100%).

      10% energy-reduction pathways will focus on no- and low-cost behavior changes such as turning off lights, lowering the thermostat on the water heater, adding weather stripping to doors, etc. We have developed a list of over 50 actions that residents will be able to choose from.

      20% energy-reduction pathways will include behavior changes and at least one efficiency upgrade such as purchasing an energy-efficient appliance or weatherizing.

      50% energy-reduction pathways will include behavior changes and a whole-home efficiency upgrade including insulation, appliances, water and space heating, and upgrading to energy-efficient windows.

      100% energy-reduction pathways will include all of the above and offsetting the home's remaining energy use with solar electric. Our goal is to create a pathway to net-zero housing for everyone in Corvallis, so we will encourage traditional solar installations when possible (i.e., for homes with solar access and the financial means to purchase a solar array). However, we will also develop programs that empower low-income families to offset their energy with solar and programs that allow residents who cannot install solar on their homes to offset their energy through a local community-supported solar installation.

2. The **type of house** they live in including single-family, historic home, small multifamily (duplex, condominium, townhome), large multifamily (apartment), and manufactured home. Many efficiency programs and incentives are based on housing type (e.g., CEW is only available for single-family homes, and Energy Trust of Oregon has a efficiency upgrade program for manufactured homes).

3. Their **income level** including low, medium, and high. We define low-income households as those with 60% of state median income by household size according to the US Department of Health and Human Services for fiscal year 2015 (e.g., annual gross income of $21,506 for one person, $28,123 for two people, $34,740 for three people, and $41,357 for four people). This category might also include more detailed questions about the community members' interest and ability to finance home efficiency upgrades and/or solar electric.

4. Their status as a **renter, homeowner, or property owner**. Property owners will be encouraged to set energy-saving goals for each of their properties and for their primary residence.

There are a myriad of energy-reduction pathways that will be suggested to participants depending on the criteria of their household, and we outline a few example pathways below:

Example 1 – Camille reduces her energy use by 10%: Camille is a student at a local high school. She and her family live in a manufactured home. She registers for the program as part of a class assignment and sets a goal of reducing the energy use at her house by 10% by doing low-cost and no-cost actions. Camille's actions include unplugging electronics when they aren't in use, washing clothes in cold water instead of hot water, and line-drying clothes. After one month, Camille and her parents notice a reduction in their electric bill. We send them information about Community Services Consortium's Weatherization Program, which could help them to further reduce their energy costs.

Example 2 – The Dunagans reduce energy use by 20% in 20 apartments: The Dunagans own a 20-unit apartment building that was built in 1970. They register for a no-cost walkthrough survey from Energy Trust of Oregon to identify energy-efficient opportunities for cash incentives, and to determine where the largest savings potential exist at their property. They decide to invest in replacing the electric baseboard heat with ductless heat pumps in all of their units, and they receive a $600 incentive per unit. Their tenants immediately notice a reduction in their energy bills, and the Dunagans arrange for all of their tenants to receive free CFL light bulbs and low-flow aerators to further reduce energy use. As units come up for rent, the Dunagans begin to advertise the energy-efficient features of the apartments, making their apartments more appealing. After they reach their energy-saving goal, we begin a conversation about how they might finance a community-supported solar electric system on their building in the coming years.

Example 3 – The Fosters reduce their energy use by 50%: When the Fosters register for the program, they commit to reducing their energy use by 50%. They are a retired couple living on a low, fixed income. They own their single-family home, which is in need of some repairs. Our program helps them develop a two-step process for reducing their energy use. First, they select no- and low-cost energy saving actions including turning off lights when they aren't in use, getting rid of their secondary garage refrigerator, and registering for free light bulbs through our Direct Install Program. Next, they register for Community Services Consortium's Weatherization program, which provides them with an efficient furnace and new windows at no cost. The Fosters achieve their goal of reducing their energy use by 50% within one year of starting the program. After they reach their goal, we send them information about the Seeds for the Sol program, which can offer them free solar-electric for their home in partnership with Habitat for Humanity.

Example 4 - The Rodriguezes go net-zero: When the Rodriguezes register for the program, they commit to reducing their energy use by 100%, or going net-zero. They own their single-family home and have a medium income. Our program helps them identify three steps to achieving their energy-saving goal. First, they select no- and low-cost actions such as lowering the thermostat on their water heater, taking shorter showers, and setting their thermostat at 68 degrees in the winter. After a few months, their electric bill is reduced by 10%. Next, they register for a free home energy review with Clean Energy Works Oregon. They learn that their home would benefit from attic insulation, a new furnace, and weatherization including duct sealing and sealing holes and cracks in their walls. They decide to pay for half of these upgrades in cash and use Clean Energy Works financing to cover the rest of the cost. After their home retrofit, their electric bill is reduced by 50%. Finally, six months later, they are ready to put solar electric on their home to offset their remaining electric bill. Using our program website, they select a local solar contractor to install their PV system, and they receive state and federal tax credits and a cash incentive from Energy Trust of Oregon.

C. **Incentivizing participation by rewarding program points**: As described above, program participants will gain points by completing specific program activities such as registering for the program online, choosing three actions to try for a month, inviting friends to register for the program, etc. The website will track and display participants' program points.

B.1.2 Creating an ongoing outreach campaign

The website is the workhorse of the program. However, effective community organizing requires thoughtful outreach planning that integrates person-to-person communication, community engagement, and appropriate technologies. Building on lessons learned from

previous Energize Corvallis programs, we will use the website as a tool to manage and track participation, but we will invest the majority of our time and resources in engaging with the community and promoting program participation.

As funding allows, our in-person outreach campaign will include tabling at events, door-to-door canvassing, and talks at local meetings and gatherings. We will also invite residents to participate in the program through social media; emails to partner organizations; and through earned and purchased media such as newspaper articles, advertisements in buses, billboard displays, radio ads, and public access television. With the assistance of a graphic designer, we will develop a suite of eye-catching outreach materials including door hangers, posters, flyers, and window displays for local businesses. We also hope to host a quarterly program gathering that is both informational and community building. Finally, we will promote community-wide events when possible such as a Lights Out Evening, DIY weatherization workshops, a climate and energy public lecture series, acts of creative disruption such as flash mobs and street theater, and public art installations focusing on energy and climate.

B.1.3 Leveraging existing partnerships and programs

We developed a number of partnerships with local organizations (see Section A.9 for a list of current program supporters). And, like many communities, Corvallis residents have access to a wide array of energy saving programs and financing (see Section A.5 for a list of existing municipal financing programs and Section A.7 for a list of incentive programs, tax credits, and finance programs).

These existing programs will be highlighted on our website and integrated into the energy-reduction pathway process. We will also feature a quarterly energy-saving program. For example, we anticipate partnering with Clean Energy Works to offer a three-month increased incentive for residents who register for a whole-home efficiency upgrade and then promote that offer by distributing door hangers. Or, we will collaborate with local contractors to create a "Baseboard Buyback" campaign with a special bulk-purchasing offer on ductless heat pumps. Or, we will partner with the City of Corvallis to promote the Neighborhood Improvement and Essential Repair programs.

B.1.4 Cultivating new partnerships and programs

As we develop energy-saving pathways, we will identify demographic sectors that do not yet have access to efficiency upgrades and financing. Then, we will create resources and programs for those sectors. For example, it is extremely difficult for residents of historic homes to get a permit to install solar electric, so we will work with the permitting office to develop a streamlined process. Or, renters do not currently have an option of going net-zero, so we anticipate creating a community-supported solar array that would allow renters to offset their energy use locally.

B.2

We will create a new program that focuses on identifying, training, and supporting local community organizers from diverse aspects of the community. These community organizers, called Community Energy Heroes, will work together to engage members of their community in the program.

Our goals are twofold. First, we will build a network of Community Energy Heroes that is representative of diverse communities in Corvallis (e.g., low-income renters, neighborhoods with high percentages of Spanish speakers, university students, faith communities, etc.). Second, we'll support the Community Energy Heroes by hosting quarterly gatherings. With ongoing support from Energize Corvallis staff and volunteers, the Community Energy Heroes will work with specific communities to 1) identify barriers to energy-reduction, 2) develop and analyze potential paths to overcome those barriers, and 3) co-create energy-reduction pathways that meet the needs of their community. For example, a Community Energy Hero from a manufactured home community might host a community meeting and learn that residents have high power bills because their homes have inadequate insulation. Then they would organize a DIY weatherization workshop where residents work together to weatherize each other's homes.

B.3

B.3.1 Types of retrofits that will be encouraged

We will encourage comprehensive retrofits including the following:

Heating and Air Conditioning Systems: duct sealing, ductless and ducted heat pumps, high efficiency gas and electric furnaces, geothermal space heating and ground-source heat pumps, and, heat- and energy-recovery ventilation systems.

Energy Efficient Windows and Doors: double-pane windows and storm windows.

Hardware Upgrades: energy-efficient light bulbs, low-flow faucet aerators, and programmable thermostats.

Solar: solar electric systems (photovoltaic), solar space heating, and solar water heating.

Water Heating Systems: high efficiency gas and electric water heaters, drain-water heat recovery systems, and heat pump water heaters.

Weatherization: whole-home insulation and air sealing.

In addition to retrofits, we will encourage no- and low-cost behavioral changes to maximize energy savings (e.g., turning down water heaters, using curtain or blinds to keep heat in or out depending on the season, changing furnace filters, etc.).

B.3.2 Retrofits financing

We will promote a number of financing programs (see Section 1.7, above, for a full list of financing programs) and the Communities Services Consortium's Weatherization Program (see Section 2.4, below), which does not require any cash from the homeowner.

B.3.3 Retrofits business resources

To set up unique marketing and outreach opportunities and bulk-purchasing campaigns, we will collaborate with energy efficiency and solar contracting businesses. Corvallis currently has the following energy efficiency and renewable energy contracting companies, many of which are Energy Trust Trade Ally contactors and Clean Energy Works participating contractors:

Energy Efficiency Contractors

Barefoot Radiant Heating LLC
Community Services Consortium
Day Heating Company
G. Christianson Construction Inc.
The Heat Pump Store
Hendricks Heating and Air Conditioning
Home Insulation Contractors Inc.
Middleton, Heating & Sheet Metal Inc.
Neil Kelly
Pace Heating & Air
Premium Efficiency
Rice Heating & Air Conditioning Inc.
Stephens Heating & Air Conditioning

Solar Electric Contractors

Abundant Solar LLC
Benton Electric Solar
Solar Ki

B.3.4 Retrofits marketing and sales strategies

We will market retrofits through an ongoing outreach campaign and by leveraging existing and new partnerships and programs, which is described above (see section B.1.3).

B.4

We will target high-return opportunities by developing energy-reduction pathways for Corvallis residents and property owners who live in or own buildings with the potential for

high return. We will target these opportunities by cultivating new and existing partnerships, as outlined below.

Affordable housing: We are exploring a number of programs and partnerships that will provide energy-reduction pathways for tenants and property owners of affordable housing buildings including:

Community Services Consortium's Weatherization Assistance Program provides free weatherization to low-income residents. Upgrades include heating system safety checks, diagnostic combustion tests, attic and wall insulation, and duct sealing and/or repair.

MPOWER (Money for Property Owner Water and Energy efficiency Retrofitting) is a regional program that promotes more efficient use of water and energy. It enables property owners to reduce energy costs and strengthens our economy through local job creation. MPOWER will finance energy efficiency improvements and energy generation systems such as solar photovoltaic to qualified property owners, with no upfront costs.

Energy Trust of Oregon's Savings Within Reach Program makes it easier for moderate-income households to afford energy-efficiency upgrades. It offers increased cash incentives that are deducted upfront from the contractor invoice.

US Department of Energy (DOE): In 2011, US DOE officials suggested that they were open to exploring a partnership with Oregon social services non-profits. These organizations can petition (simultaneously) for low- income housing repair funds from the US Department of Housing and Urban Development, and can seek low- income housing energy efficiency retrofit funds that initiate in the Department of Energy. This is a departure from current practices, where these organizations operate separate missions and budget cycles. The US DOE officials indicated that they would lead these conversations with their HUD counterparts. We plan to work directly with the US DOE and/or through the Community Services Consortium and Willamette Neighborhood Housing/Benton County Habitat for Humanity in making these connections.

Residential rentals: We will develop a suite of energy-reduction pathways for property owners and renters, through a variety of new partnerships and programs such as:

Property owner work session: We want to understand the challenges that local property owners face when considering energy efficiency upgrades. To solicit input, we will partner with real estate management and municipal staff to invite property owners to share their concerns at work sessions. Based on these work sessions, we will build strategic partnerships, identify owner needs and develop programs to meet those needs.

Investor/Renter Partnership: To recruit investors for home purchases within the Corvallis city limits, we will partner with the Community Services Consortium or Willamette Neighborhood Housing Services. Non-profits will secure residents for these homes, specifically residents willing to provide labor for energy efficiency upgrades to the homes. In turn, residents will earn a subsidy toward their rents. The Community Services Consortium will provide training to residents through their Weatherization Training Center and through their Youth Build program. In addition, CSC will provide oversight on any work completed on the homes.

Buildings in historic neighborhoods: We will identify historic building energy upgrade opportunities in collaboration with Preservation WORKS, a partner organization that specializes in the historic district in Corvallis.

B.5

We developed preliminary program goals that will allow us to measure and evaluate the success of the program in the following ways:

Quantitative Program Goal	**Measurement Tool**
100% of households (21,000 households) receive at least one invitation to participate in the program	No. of invitations sent
20% of households (4,200 households) receive programmatic information quarterly	No. of outreach materials distributed
10% of households (2,100 household) take actions to reduce their energy use by 10%	Program website
3% of households (630 households) take actions to reduce their energy use by 20%	Program website
2% of households (420 households) take actions to reduce their energy use by 50%	Program website
1% of households (210 households) take actions to reduce their energy use by 100%	Program website
10% of households (2,100 households) will receive educational information about the full fuel cycle	No. of people completing educational program online
5% reduction in Corvallis electric and natural gas use	Utility data

Qualitative Program Goals

- **Case studies** that outline the development, implementation, and lessons learned from energy-reduction programs that we pilot during the competition (e.g., Seeds for the Sol, Community Energy Heroes).
- A "**User's Guide to the Communities Take Charge Website**" toolkit will explain how other communities can use the website and online tool so that other communities will be able to successfully use the website in the future.

- A "**Launching Your Communities Take Charge Program**" toolkit will outline how to effectively launch and manage a local Communities Take Charge program based on lessons learned in Corvallis.

B.6

There are a number of long-term program components that might reduce energy use during the two-year competition, but will have more significant contributions to energy-use reductions after the competition. For example:

- The implementation of new land use and development building codes
- Widespread use of the Energy Performance Score
- Community-supported solar projects
- Requiring low-embedded energy approaches in site designs of new developments
- Stretch codes that can apply higher standards and incentives to applicable development projects
- Tightening property maintenance codes to require better existing building performance requirements

C. Utility Data Reporting

C.1

Initially, the Corvallis GUEP Steering Committee sought commitments from the utilities by working with established contacts in the Corvallis Department of Public Works. We expect the utilities to provide the data required for the GUEP competition.

Additionally, the Steering Committee is exploring additional partnership opportunities with the utilities. Some of these opportunities include joint energy efficiency programs, direct marketing to utility customers, and access to finer-grained usage data to help pinpoint high-value opportunities within the customer base. We have already engaged with the predominant electric utility, with encouraging results.

C.2

All three of our utilities (Pacific Power, Consumers Power, and Northwest Natural) will identify residential energy consumers using the billing rate class.

Some multi-family residential dwellings are not individually metered, and are therefore charged at a commercial rate. We will work with the City of Corvallis and the utilities to identify the largest of such dwellings, and obtain their energy usage based on an

enumerated list. According to the utilities, these dwellings represent a very small fraction of the multi-family housing units in Corvallis.

C.3

The City of Corvallis Department of Public Works has identified, per the criteria in the GUEP Guidelines, all municipal accounts serviced by each of the local utilities. The utilities will use these account lists to compute aggregate municipal energy usage.

Corvallis public schools are not municipal energy accounts. We have compiled a separate list of public and private schools, which the utilities will include in their computation of total municipal energy usage.

C.4

The below table lists all Corvallis municipal accounts, excluding schools.

Utility	Service Locations	Account Numbers
Pacific Power (electricity)	All City buildings, water treatment plant, wastewater treatment plant, pumping stations, fire stations, traffic signals, parking lot lights, and all other misc. electrical. 190 meters total.	18516331-001
Consumers Power (electricity)	Rock Creek water treatment plant	1153700, 1153706, 1153712, 1153701, 1153721
	Traffic signals	1153707, 1153719, 1153713, 1153711
	Pump stations	1153704, 1153705, 1153714, 1153708, 1153718, 1153703
	Water reservoir	1153710
	Park facilities	1153716, 1153724, 1153717, 1153709
	Fire station	1153720
Northwest Natural (natural gas)	Various city facilities. 22 meters total.	305177-8
	Osborn Aquatic Center	485799-1

D. Innovation

D.1

We have developed a Program Plan that has innovation at its core. Creating energy-reduction pathways that will empower every household in Corvallis, regardless of socio-economic status or housing type, to reduce their energy use by 10%, 20%, 50%, or 100%. Other innovative aspects of our plan include the following:

Innovation in behavior change programs: Our program will offer an innovative approach to encouraging, tracking, and estimating energy savings associated with behavior change. Rather than assigning an estimated energy savings to each action, the online tool will calculate energy savings based on participant responses to a customized exit survey that is automatically sent one month after the participant registers for the program. In the exit survey, each action the participant choses will be tied to a series of follow-up questions, and in the backend of the online tool, every potential answer will be tied to a numerical value. The numerical value of each of the respondents' answers will be multiplied to estimate the energy savings for each action. The website will also check in with participants two, three, six, and twelve months after they pledge to try an action to track how successful they were at maintaining long term behavior change.

Innovative solar financing: The Seeds for the Sol program, which is being developed and piloted in Corvallis, is testing a new model for solar financing based on wealth sharing.

Innovative community solar: For the first time, Oregon residents can now come together to own solar projects in their own communities, thanks to Oregon's pioneering new renewable energy cooperatives law. The law, which went into effect in October 2014, lets Oregon residents form co-ops to invest collectively in solar projects. People who were shut out of solar until now, including renters and homeowners with roofs that are too shaded for solar, can now own a share of a solar project in their community. We will work to develop an effective model for a community solar array in Corvallis that will allow residents to offset their energy use locally.

Innovation in reporting building energy performance in the real estate market: Oregon recently passed legislation that allows building owners to report their properties' Energy Performance Scores (EPS) in sales marketing materials, using standardized measurements. The EPS scorecard graphically illustrates a home's energy score (based on total energy use) as well as its carbon footprint, and shows homeowners how their home compares to state averages and targets for homes. The EPS scorecard is paired with an EPS energy analysis report, which provides in-depth information on a home's performance and provides upgrade recommendations, along with estimated costs and energy savings. As real estate professionals and

buyers become more aware of the value of a standardized EPS, we expect that more incentive will exist to upgrade properties, report higher scores, and increase demand for properties with higher scores. We also hope to apply these principles to the rental market. We want tenants to demand more transparency into the cost of utilities when looking for rental properties.

While we have a number of innovative program aspects already in place, we look forward to encouraging innovation throughout the competition. We plan to host Energy Innovation Happy Hours at local bars where community members, city officials, and researchers and developers share a drink and exchange ideas about energy innovation for Corvallis. We will also reach out to faculty at Oregon State University who are working on innovative energy technologies (e.g., plans for a net-zero wastewater treatment plant).

E. Potential for Replication

E.1

Energize Corvallis has a history of developing programs that can be replicated in other communities, and we will uphold that tradition during this competition. We are developing our programs and website with other communities in mind, and plan to create resources for other communities including case studies and toolkits, as described in Section B.5, above (p. 22).

F. Likely Future Performance

F.1

We anticipate that most of the energy-savings resulting from the action taken during the competition will be permanent for a number of reasons:

Building Upgrades: Many of the energy-reduction pathways will focus on energy-efficiency upgrades to properties, which will continue to reduce the energy use of the property for many years after the competition.

Renewable Energy Infrastructure: We will encourage the installation of solar electric on homes through community-supported solar projects. Once installed, these systems will continue to offset energy use for decades.

Policy: A number of the proposed changes to local development policies will likely result in lasting energy savings (see Section 1.4, above, for a list of potential policies).

Institutionalizing Programs: We plan to integrate the program into the fabric of a number of institutions including middle and high schools, Oregon State University, and other major employers. In that way, energy-reduction pathways and website usage will not only be available, but will be commonplace with the next generation.

Ongoing Behavior Change: We will use the website to quantify each program participant's ongoing behavior change. As previously mentioned, a preliminary study demonstrated that 2/3 of participants will maintain their behavior changes and nearly 3/4 participants might become more involved in sustainability efforts because of their program participation. We will build on this preliminary study during the two-year competition and track behavior change over a longer period of time.

F.2

The program website will collect, manage, and display the number of program participants, as well as the community's estimated savings to date including CO_2 equivalent, kilowatts, therms, and gallons of water. The site will also display a series of other metrics such as the number of households that have committed to a 10%, 20%, 50%, or 100% reduction; the number of households who are utilizing specific programs such as Clean Energy Works, Seeds for the Sol, or Community Services Consortium; and the number of people who have committed to doing certain energy-reduction actions like changing their furnace filters, unplugging electronics, and lowering their thermostats. We are collaborating with our local utilities to generate data about metered energy savings, and we plan to display this information on the website as well. Finally, we will include data for the GUEP website when it becomes available so that Corvallis knows where it stands in the national competition ranking. In addition to displaying program metrics on the website, this information will be included it in marketing materials throughout the competition.

G. Education

G.1

We are developing a Classrooms Take Charge program and website will encourage middle and high school students to reduce their energy use. The program will reinforce key concepts from the Carbon TIME curriculum unit "Human Energy Systems," which focuses on carbon cycling and tracing matter and energy through human energy systems. We will encourage Corvallis teachers to use the program in their classrooms by offering free workshops, program materials, and online resources. During the Classrooms Take Charge program, student learning will be supported in three phases:

1) **In-class learning**: Carbon TIME unit "Human Energy Systems" supports student learning about fossil fuel use and its effects. Students learn about combustion of fossil fuels as a power source, explore behaviors that increase or decrease fossil fuel

use, and consider actions that affect the corresponding levels of CO_2 emissions. The Human Energy Systems unit builds on student explanations of carbon dioxide release into the atmosphere as a result of transportation, building, food and agricultural systems, and electrical systems.

2) **Online learning**: The Classrooms Take Charge website will further support learning by revisiting key concepts from Carbon TIME, and by encouraging behavior change as students discover how their daily actions affect CO_2 release. Students will visit the website and choose 3-5 energy-saving actions to try for a month. The website will prompt students to trace how their behavior change reduces energy consumption and therefore reduces carbon emissions. One month after students register for their energy-saving actions, the website will prompt students to report on how successful they were at completing each of their actions.

3) **Service learning**: When students complete the in-class and online components, they will participate in a school-wide, service-learning project. Within this project, they will develop educational outreach materials that integrate key learning objectives from Carbon TIME. In addition, they will encourage other students and community members to use the program website and adopt energy-saving behaviors. The website will then track program enrollment and CO_2 savings for each participating school. With this data, schools can engage in friendly competition or, in future years, compete with their own school's previous record for CO2 emissions reduction.

G.2

We are developing community-wide educational programs that will 1) inform community members about the total energy and environmental costs of the full fuel cycle, and 2) engage community members in reducing their energy use. The cornerstone of the educational program will be quarterly gatherings featuring a variety of educational opportunities such as guest speakers, energy-efficient home tours, DIY energy efficiency sessions, "Talk with a Contractor" booths, energy efficiency program tabling, energy knowledge games, and meet-and-greets. We will host these gatherings in collaboration with utility partners, trade allies, and community partners. Additionally, educational components about the full fuel cycle will be featured on the program website, so when community members register for the program, they have the opportunity to learn about the fuel cycle in more detail.

H. Prize Purse

H.1

We propose using the prize purse to create an endowment for a Community Climate Laboratory. The Laboratory will be dedicated to developing, piloting, and analyzing replicable energy-reduction programs, energy innovations, and financing models in

Corvallis. Our goal is to share these resources with communities throughout the United States.

The $5 million endowment will be managed by the Corvallis Environmental Center and invested in a socially and environmentally responsible manner. Assuming a 4% return on investment, this should provide a $200,000 annual operating budget for the Community Climate Lab. Our goal is to share these resources with communities throughout the United States. This operating budget will be used to maintain existing Corvallis programs that have proven to be successful at reducing energy use. In addition, it will provide necessary capital to spur innovation, targeting new programming and financing mechanisms to benefit Corvallis' diverse demographic and economic sectors. More specifically, the endowment will fund a series of competitive grants available to organizations, businesses, and individuals in Corvallis such as:

Wage Grants to support positions that further the goals of energy efficiency and conservation. For example, the City of Corvallis could hire an intern to develop a new efficiency code, or a local non-profit might hire an outreach coordinator for a new energy program.

Incentive Grants to support the creation and implementation of efficiency incentives. For example, a Corvallis Weatherization Incentive Program that provides homeowners and property owners with additional cash incentives to weatherize their properties.

Infrastructure Grants to support energy efficiency and renewable energy projects.

Program Grants to develop, pilot, and analyze new energy-reduction programs.

Research Grants to support the development and implementation of energy-efficiency and renewable energy technologies.

In the first year of the endowment, a portion of the investment income will be allocated to award raffle prizes for households who participated in the two-year competition and to reimburse donors who provided financial support during the competition. For example, we will be inviting 30 businesses to contribute $1,000 toward the operating cost of programs in 2015-2016, and when we win the prize purse, we will offer to reimburse those businesses for their up-front program support or invite them to re-invest the money in making their business more energy efficient.

Appendix A: Program Budget

Income	Year 1 (2015)	Year 2 (2016)
Grants	60,000	50,000
Support from local businesses and community organizations	30,000	15,000
Donations	10,000	5,000
In-kind Support	40,000	40,000
Annual Income	**140,000**	**110,000**
Total Project Income		**250,000**

Expenses	Year 1	Year 2
Personnel		
Director: 0.3 FTE at $68,000 Y1&2	20,400	20,400
Environmental Engineer 0.1 FTE at $68,000 Y1&Y2	6,800	6,800
Program Coordinator 0.1 FTE at $37,440 Y1&2	3,744	3,744
Software Developer $27 (200hrs Y1 & 100hrs Y2)	5,400	2,700
IT Specialist 0.1FTE at $68,000	6,800	6,800
Graphic Designer: Y1 (100hrs x $20/hr) Y2 (50hrs x $20)	2,000	1,000
GUEP Outreach Coordinator 1.0 FTE @ $27,000 Y1&Y2	27,000	27,000
Communication Coordinator 0.2 FTE at $37,440 Y1&2	7,488	7,488
Community Organizers (8 positions x $1,500 honorarium)	12,000	12,000
Personnel Subtotal	**91,632**	**87,932**
Payroll Taxes		
Payroll Taxes (13% of personnel expenses)	11,912	11,431
Payroll Taxes Subtotal	**11,912**	**11,431**
Program Supplies		
Printing (door hangers, posters, brochures, flyers, etc.)	5,000	4,000
Program materials (shirts, tabling supplies, paper, printer ink, etc.)	8,000	6,365
Website hosting fees	500	500
Supplies and Printing Subtotal	**13,500**	**10,865**
Program Expenses Subtotal	**117,044**	**110,228**
CEC Overhead		
10% of expenses (Overhead includes office space, phone, internet, utilities, and office manager salary)	11,704	11,023
Overhead Subtotal	**11,704**	**11,023**
Annual Expenses	**128,749**	**121,251**
Total Project Expenses		**250,000**

CLIMATE ACTION PLAN

for

Corvallis, Oregon

Prepared by the

Corvallis Climate Action Plan Task Force

January 2015

Corvallis Climate Action Plan

Contents

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Introduction

Nearly 15 years ago, Corvallis agreed to work collaboratively with other cities and agencies to address climate change by signing on to the Cities for Climate Protection campaign (2000). The City pledged to take a leadership role in increasing energy efficiency and reducing greenhouse gas emissions from municipal operations and to develop and implement a local climate action plan outlining steps for the community to reduce greenhouse gas (GHG) emissions. Corvallis made similar commitments when it subsequently signed the U.S. Mayors Climate Protection Agreement (2005) and became a member of ICLEI—Local Governments for Sustainability (2008) (see Figure 1). The City has taken many actions to increase energy efficiency and completed municipal and community greenhouse gas inventories, but it has yet to develop a climate action plan.

Why a Climate Action Plan?

On November 2, 2014, the U.N. *Intergovernmental Panel on Climate Change (IPCC)* released the "synthesis" report of its fifth full scientific climate assessment since 1990. More than 100 governments signed off line by line on this review of more than 30,000 studies on climate science, impacts, and solutions. In the report, the world's top scientists and governments issued their bluntest plea yet to the world: Slash carbon pollution now or risk "severe, pervasive and irreversible impacts for people and ecosystems."[1] The risks include substantial species extinction, global and regional food insecurity, and consequential constraints on common human activities, such as growing food and working outdoors. Scientists have "high confidence" that these devastating impacts will occur—"even with adaptation"—if we keep doing little or nothing.

The IPCC report and others make clear that climate change is already leaving its mark and that future generations cannot plausibly undo the damage already done: carbon dioxide and other *greenhouse gases* currently in the atmosphere and produced today will remain and continue to affect the climate for decades. The IPCC echoes the warnings of the National Climate Assessment (NCA) report released in May by the U.S. Global Change Research Program. The Assessment outlines the effects climate change is having in the United States and the dire consequences that can be expected if no action is taken to mitigate global warming:

> *Climate change, once considered an issue for a distant future, has moved firmly into the present. Corn producers in Iowa, oyster growers in Washington State, and maple syrup producers in Vermont are all observing climate-related changes that are outside of recent experience. So, too, are coastal planners in Florida, water managers in the arid Southwest, city dwellers from Phoenix to New York, and Native Peoples on tribal lands from Louisiana to Alaska*.[2]

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[1] "Climate Change 2014 Synthesis Report," *IPCC Fifth Assessment Synthesis Report*, November 2014: http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_SPM.pdf.

[2] *National Climate Assessment*, U.S. Global Change Research Program, May 2014: http://nca2014.globalchange.gov/report/regions/northwest.

The Corvallis area will see a number of important changes:

- Average annual temperatures will increase by 8 to 12º F by around 2080.
- Reduced snowpack and changing snowmelt will result in lower stream flows in summer. This will reduce the availability of irrigation water even as higher temperatures increase the demand for water for agricultural uses.
- More intense storms (rain and snow) will increase flood risk and *stormwater* management challenges.
- Increased river flooding and winter flows, decreased summer flows, and higher stream temperatures will threaten many species, particularly salmon, steelhead, and trout.
- Field crops, fruit trees, and livestock will face an increased probability of heat stress.
- The combined impacts of increasing wildfire, insect outbreaks, and tree diseases will increase forest mortality and transform forest landscapes.
- Humans will suffer higher rates of heat-related illness, exhaustion, asthma, and respiratory diseases.[3,4]
  (See Appendix A for more detail on how climate change will affect the Pacific Northwest.)

In addition to these physical impacts, climate change is expected to have significant financial impacts, particularly if it accelerates and if we don't prepare for the impacts. Multiple studies illustrate why it is necessary to act on climate change as soon as possible:

- *An Overview of Potential Economic Costs to Oregon of a Business-As-Usual Approach to Climate Change* says, "If spread evenly, Oregon's households, on average, could incur annual costs of $1,930 per year by 2020. Of this amount, $830 relate to expenditures on energy, $460 relate to health-related costs, and $370 to the adverse effects of climate change on salmon populations. These costs are not negligible. The 2020 average of $1,930 represents more than 4 percent of the current median household income in Oregon."[5]
- The White House Council of Economic Advisors estimates that the US will suffer $150 billion in economic damages each year if we fail to prevent global temperatures from increasing two degrees Celsius above pre-industrial levels.[6]
- The Risky Business Project determined that a "business as usual" approach to climate change will cost the nation up to $507 billion in property damages by 2100.[7]

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[3] *Preparing for Climate Change in the Upper Willamette River Basin of Western Oregon: Co-Beneficial Planning for Communities and Ecosystems*, US Department of Agriculture, Climate Leadership Initiative, and National Center for Conservation Science and Policy, March 2009: http://uonews.uoregon.edu/sites/uonews2.wc-sites.uoregon.edu/files/uploads/UpperWillamette_REPORT.pdf

[4] *National Climate Assessment,* 2014.

[5] *An Overview of Potential Economic Costs to Oregon of a Business-As-Usual Approach to Climate Change*, Climate Leadership Initiative, University of Oregon, February 2009: http://uonews.uoregon.edu/sites/uonews2.wc-sites.uoregon.edu/files/uploads/OR-Fnl_Rpt.pdf.

[6] *The Cost of Delaying Action To Stem Climate Change*, White House Council of Economic Advisors, July 2014: http://www.whitehouse.gov/sites/default/files/docs/the_cost_of_delaying_action_to_stem_climate_change.pdf.

[7] *Risky Business: The Economic Risks of Climate Change in the United States*, Risky Business Project, June 2014: http://riskybusiness.org/uploads/files/RiskyBusiness_PrintedReport_FINAL_WEB_OPTIMIZED.pdf.

The Opportunity for Climate Prosperity

As alarming as the IPCC synthesis report is, it is also hopeful. The world's top scientists and governments make clear—as they have in a number of previous reports—that the cost of action is relatively trivial: "Mitigation scenarios that are *likely* to limit warming to below 2°C" entail "an annualized reduction of consumption growth by 0.04 to 0.14 (median: 0.06) percentage points over the century relative to annualized consumption growth in the baseline that is between 1.6 percent and 3 percent per year (*high confidence*)." In other words, the cost of even the most aggressive action—the kind needed to stave off irreversible disaster—is so low that it would not noticeably change the growth curve of the world economy this century. The authors say with high confidence that reducing annual consumption growth as little as, for example, 2.4 percent per year down to 2.34 percent per year, would be effective in limiting warming.

Other reports suggest that taking action now will result in significant savings. "Washington Western Climate Initiative Economic Impact Analysis"[8] and "Pathways to a Low-Carbon Economy,"[9] suggest that reducing energy use and preparing for climate change will quickly save citizens, businesses, and governments millions of dollars by reducing energy costs and creating sorely needed jobs.

Recognizing the risks and opportunities that climate change poses, cities all over the country are committing to address climate change at the local level. By implementing innovative programs to reduce the GHG emissions, or "carbon footprint" of government operations and the community, they also are saving money and improving the economic, environmental and social sustainability of their communities.

A Vision for Today, 2020, and Beyond

In 1997, our community articulated its desired future in the *Corvallis 2020 Vision Statement*.[10] Although it was adopted the same year as the Kyoto Protocol, the Vision Statement does not specifically address climate change; at that time, most Americans simply did not believe that global warming was going to affect them in their lifetimes.[11] However, the seven focus areas of the Vision Statement provide many openings for emissions reduction (see Appendix B for details). Anticipated updates of the *Corvallis 2020 Vision Statement*, the Comprehensive Plan, and the Transportation System Plan—along with development of a climate action plan—offer opportunities for our community to respond to the challenge of climate change with a new vision of integrated action, led by local government in partnership with business and civil society.

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[8] *Washington Western Climate Initiative Economic Impact Analysis*, ECONorthwest, February 2010: http://www.ecy.wa.gov/climatechange/docs/20100707_wci_econanalysis.pdf.

[9] *Pathways to a Low-Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve*, McKinsey and Company, 2009: download from http://www.mckinsey.com/client_service/sustainability/latest_thinking/greenhouse_gas_abatement_cost_curves.

[10] *Corvallis 2020 Vision Statement*: http://www.corvallisoregon.gov/modules/showdocument.aspx?documentid=14

[11] "Americans' Global Warming Concerns Continue to Drop," *Gallup Politics*, March 11, 2010, www.gallup.com/poll/126560/americans-global-warming-concerns-continue-drop.aspx.

This Climate Action Plan is an attempt to create a framework that offers direction and focus on the most serious threat facing the world today and to set priorities and a course for progress for our community. Drawing on similar plans developed by other cities, the state of Oregon and other states, it pinpoints issues critically important not only to reducing greenhouse gas emissions, but to maintaining our quality of life in the face of a changing climate that threatens food and water sources, power supplies, public safety and health, forests and local economies. Identifying strategies and actions that can feasibly and effectively reduce our community's greenhouse gas emissions would achieve numerous benefits that not only would move Corvallis toward realizing its 2020 vision but also would build a more secure and resilient community for future generations.

Corvallis Climate Action Policy

Cities for Climate Protection Campaign (CCP). Initiated in 1993 by the United Nations Environment Program and the International Council for Local Environmental Initiatives (ICLEI), the Campaign was the first international initiative that aimed to facilitate emissions reduction of local governments through a five milestone process of measurement, commitment, planning, implementing and monitoring. The City of Corvallis passed its resolution joining the CCP in April 2000. As of 2009, the CCP Campaign had grown to more than 1000 local governments worldwide.

U.S. Mayors Climate Protection Agreement. Established by Seattle Mayor Greg Nickels in 2005, the Agreement challenges participating cities to meet or beat the Kyoto Protocol targets and to urge the state and federal government and U.S. Congress to enact policies and programs to reduce greenhouse gas emissions. Corvallis Mayor Helen Berg signed the Agreement in 2005, and Mayor Charles Tomlinson reaffirmed the City's participation 2007. As of October 2009, 1,000 mayors representing more than 86 million residents had signed the agreement.

City of Corvallis *Greenhouse Gas Inventory for Municipal Government Operations*. [12] In 2008, the City contracted with Merit System Services for an inventory of emissions from government operations. In early 2010, City staff completed the final report for presentation to the City Council and assumed responsibility for future inventories. The City planned to update the inventory every two years, but thus far no updates have been completed.

***Community Energy Strategy: A 2020 Framework*.** In 2009, the City Council created the Energy Strategy Ad Hoc Committee (ESAHC), which completed the *Community Energy Strategy* "in a context of increasing urgency and a strong sense that we need to begin acting now to increase our energy security and reduce our contribution to global climate change."[13] The 10-year plan focuses on energy conservation and efficiency, renewable and/or low carbon energy sources, and local clean-energy business. The ESAHC also compiled existing energy and sustainability policies and conducted a gap assessment of current policies and where the City could be in terms of achieving community energy goals. In January 2010, the City Council approved the Strategy and adopted the compilation of existing policies as a reference guide to the Corvallis City Council Policy Manual.

***Corvallis Community Greenhouse Gas Emissions Inventory Report*.** [14] In 2014, with support from a grant provided by the Environmental Protection Agency's Climate Showcase Communities Program, City staff and community partners completed an inventory of the community's greenhouse gas (GHG) emissions. The inventory accounts for emissions related to buildings, energy use, and transportation, and attempts to measure the energy and associated emissions used to make, transport, store, distribute and dispose of the consumer goods and services we use.

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[12] *Greenhouse Gas Inventory for Municipal Government Operations*, City of Corvallis, October 2010 http://archive.corvallisoregon.gov/0/doc/285255/Electronic.aspx.

[13] "Draft Energy Strategy," Memorandum from Energy Strategy Ad Hoc Committee to Mayor and City Council, 17 December 2009: http://archive.corvallisoregon.gov/0/doc/260963/Electronic.aspx.

[14] *City of Corvallis 2012 Community Greenhouse Gas Inventory Report*, City of Corvallis, May 2010: http://archive.corvallisoregon.gov/0/doc/420074/Electronic.aspx.


Oregon legislature establishes carbon-reduction goal
1989
Corvallis adopts 2020 Vision Statement
Kyoto Protocol
1997
Oregon strategy for Greenhouse Gas Reductions completed
Corvallis passes resolution urging residents and businesses to purchase renewable power
Corvallis signs US Mayors Climate Protection Agreement, striving to meet or beat Kyoto targets
2005
Corvallis Sustainability Coalition and Energy Trust of Oregon launch Corvallis Energy Challenge, Oregon's first community energy project
Corvallis joins ICLEI—Local Governments for Sustainability, an organization committed to advancing climate protection
2008
Corvallis wins EPA's first Green Power Community of the Year award
City completes greenhouse gas inventory for municipal government operations
City wins EPA Climate Showcase Communities grant
2010
City goal: Reduce overall community fossil fuel use 30% below 2012 levels
State of Oregon Goal: Reduce greenhouse gas emissions 10% below 1990 levels
2020
City goal: Reduce overall community fossil fuel use 85% below 2012 levels
State of Oregon Goal: Reduce greenhouse gas emissions 75% below 1990 levels
2050
1992
Rio Earth Summit (United Nations framework convention on climate change)
2000
Corvallis commits to Cities for Climate Protection Campaign
2006
Corvallis becomes first West Coast city named EPA "Green Power Community"
2009
City Council Energy Strategy Committee develops *Community Energy Strategy: A 2020 Framework*
2008 – 2012
Kyoto Protocol compliance period (United States target: 7% below 1990 levels)
2014
City completes first community greenhouse gas inventory
Corvallis Climate Action Plan started
2030
City goal: Reduce overall community fossil fuel use 55% below 2012 levels
TIMELINE AND GOALS

The Corvallis Climate Action Plan

Plan Development

In early 2013, when the Corvallis City Council solicited input from the community on goals for its two-year term, the Corvallis Sustainability Coalition Steering Committee submitted the following:

> *Adopt a City Council goal to assess the status of the City's greenhouse gas reduction efforts, set significant greenhouse gas reduction goals, and identify action items that will help move the City toward those goals.*

The Council did not adopt a climate action goal, but the Coalition Steering Committee decided to proceed with work on a climate action plan via a task force because it did not want to wait another two years to see progress. Meanwhile, other efforts to address climate change were emerging or coalescing in Corvallis, such as the founding of 350Corvalls and a chapter of the Citizens Climate Lobby, and initiatives by the Sierra Club, the League of Women Voters, and the environmental and stewardship committees of a number of faith groups.

Representatives of these groups came together in May 2013 to form the Corvallis Climate Action Plan Task Force. In June 2014, when City staff presented the results of the community greenhouse gas inventory to the City Council, the Task Force requested that the City follow up on the inventory with the next steps in ICLEI's five-milestone process, namely by adopting an emissions reduction target and developing a local climate action plan. The Council referred the request to the Urban Services Committee, and the Task Force worked with the Committee over the summer to develop a Scope of Work for proceeding with a community-led process of developing a climate action plan.

Task Force Members

Membership in the Climate Action Plan Task Force has changed since the initial meetings, and the current Task Force is grateful and indebted to all who have participated (see Acknowledgements) for their expertise and input on planning processes, topic areas, development of the plan and the plan document, public outreach, and general support. The current Task Force members who researched and drafted sections of this plan are:

Team Member	**Partner Agency/Group**
Julie Arrington	Marys Peak Group—Sierra Club
Zachariah Baker	Member at Large
Dan Blaustein-Rejto	Member at Large
Glencora Borradaile	Member at Large
Claudia Keith	League of Women Voters
Linda Lovett	Corvallis Sustainability Coalition
Annette Mills	League of Women Voters
Kris Paul	350 Corvallis
Marge Stevens	First United Methodist Church Natural Step Ministry

Drafting Process

Research. The process of drafting the CAP began with research into other municipal and state climate and energy action plans so that we might build on the best practices and research of other successful efforts. The Task Force also researched existing local policies and plans in order to build on and incorporate previous efforts, such as the City's greenhouse gas inventories, and align with existing efforts, such as Benton County's Climate Change Adaptation Plan.

The lead author on each topic area compiled information from some key sources:

- ***Community Sustainability Action Plan***. This long-range, visionary document was developed in 2008 by the Corvallis Sustainability Coalition to meet the Corvallis City Council's goal "to develop a community-wide sustainability initiative." The plan was the result of a landmark community process that revolved around three town hall meetings and involved hundreds of Corvallis residents and thousands of volunteer hours. The 2008 Action Plan was revised in 2012-13 and again received public review and feedback through a series of "Community Conversations." The revised document, titled *Community Sustainability: A Framework for Action,* was published in 2013.
- ***Climate action plans from other cities.*** Of the many municipal climate action plans that Task Force members reviewed, those from the cities of Portland and Eugene were particularly useful. For example, the objectives and actions in the topic areas of this plan draw upon the strategy lists that Eugene compiled using information from regional experts and municipal- and state-level climate and energy plans from across the nation. Corvallis Task Force members saved a great deal of time by not having to duplicate this effort.
- ***Oregon Global Warming Commission "Roadmap to 2020."*** This document offers recommendations for how Oregon can meet its 2020 greenhouse gas reduction goal (10% below 1990 levels), get a head start toward its 2050 goal (at least 75% below 1990 levels), and build a prosperous, clean-energy-based 21st century state economy. Six technical subcommittees drawn from business, academia, non-governmental organizations, local government and state agency staff did the initial work of describing scenarios, sifting through possible recommendations and evaluating them. In October 2010, the Commission unanimously adopted the Interim "Roadmap to 2020" Report.

Review. The lead authors of the topic areas in this plan invited community members with broad knowledge of the topic and the ability to bring a variety of perspectives to review their sections. The topic specialists reviewed proposed actions in greater detail, provided input on priorities, clarified ideas, identified opportunities and challenges, and helped to ground the process in Corvallis's unique economic, social, and environmental conditions. A complete list of Topic Specialists can be found in Appendix F.

The Task Force also developed an Advisory Panel composed of people with expertise in the process of developing a climate action plan and/or climate change mitigation and adaptation. As the Advisory Panel reviews the draft of the plan, it is providing technical information, helping to prioritize strategies and actions, and advising on implementation. A list of Advisory Panel members is in Appendix G.

Outreach. The Task Force held two public forums—October 29 and November 12, 2014—to engage community members interested in climate and energy challenges as they relate to each of the six topic areas. About 60 community members, including Task Force members, topic specialists, and City Councilors attended each forum. Participants reviewed the strategy list for each topic area, provided perspectives on which actions should be given the highest priority, identified missing actions or strategies, and offered suggestions on how to implement individual actions.

Equity Principles

The Task Force has attempted to draft this climate action plan such that it expresses the urgency for integrated action at the local level, led by local government in partnership with business and civil society. While the plan is directed primarily toward the Corvallis City Council and staff, climate action is an effort the entire community needs to support and act on, not something that only the local government adopts and implements.

Therefore, the Task Force attempted to view strategies and actions to address climate change through the lens of social equity. As noted in the Introduction and in the City Council's Community Sustainability Policy, sustainable communities are ones that "encourage and develop connections between environmental quality, economic vitality, and social equity" and that "equitably distribute the costs of improving sustainability."[15] Therefore, when considering action on climate change, it is important to consider the following equity principles: [16]

- **Healthy:** Mitigate environmental factors leading to health disparities, such as barriers to active lifestyles and transportation, pollution exposure, disparate access to green space and other natural resources.
- **Safe and Livable:** Promote investments in housing energy efficiency that will make them safer, more comfortable and affordable, and in community infrastructure that enhances pedestrian and bike safety, and other elements of livability.
- **Accessible:** Promote investments that improve neighborhood accessibility, by bringing services to underserved neighborhoods and supporting equitable expansions of public transit and active transportation infrastructure.
- **Prosperous:** Promote the creation of employment and small business opportunities with potential to lift up and empower households and communities, and maximize that potential

[15] *CP 2010-1.12 Community Sustainability Policy*, City of Corvallis, rev April 14, 2014.
[16] Memo Re: Equity Scan for the 2013 Portland/Multnomah County Climate Action Plan, August 8, 3013: http://www.portlandoregon.gov/bps/article/463573

through equitable hiring and contracting policies that target those opportunities toward historically underrepresented populations.

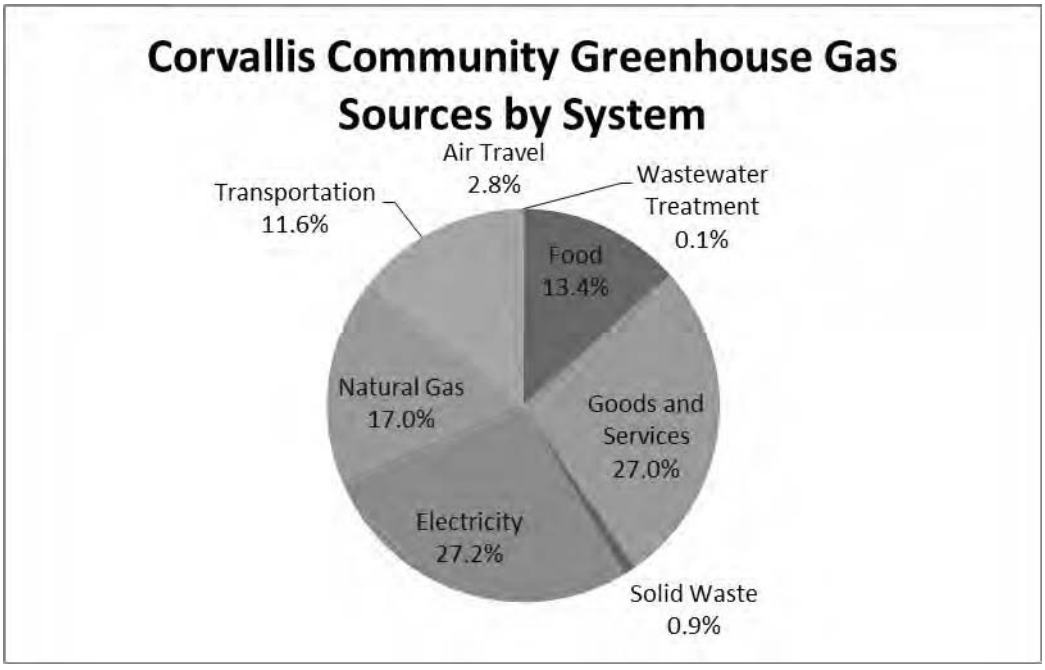
- **Inclusive:** Include communities of color and other historically underrepresented populations in every step of the climate action planning process, from the definition of goals to implementation. Undertake proactive, culturally appropriate strategies to reach out to these populations and involve and empower them through the CAP's actions and programs.

Plan Scope and Organization

Sources of Emissions

In Corvallis, most greenhouse gas emissions result from energy consumed in buildings and vehicles and from energy associated with making, transporting, storing, distributing and disposing of the goods and services we consume. The community emissions cited in this plan are from the *City of Corvallis 2012 Community Greenhouse Gas Inventory Report*, which was completed under the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, a methodology developed by ICLEI–Local Governments for Sustainability and released in October, 2012.

Total emissions for the community in 2012 are estimated at 1,257,115 Metric Tons Carbon Dioxide Equivalent (MT CO_2e). Emissions sources included in the inventory cover the broad categories of stationary emissions, electricity, transportation, solid waste, and the emissions associated with household and government consumption of food, goods and services. The chart below summarizes the findings based on the five Basic Emissions Generating Activities plus Household and Government Consumption.



Geographic Scope

The boundary for which emissions were calculated in the community greenhouse gas inventory was Corvallis city limits. Therefore, this climate action plan also uses city limits as the boundary for most of the recommended objectives and actions.

However, the plan is intended to reach well beyond city limits; citizens, topic experts and partners from Corvallis, the surrounding community, and even beyond came together to develop this plan because climate change poses challenges and opportunities that will require partnerships and joint efforts far beyond the Corvallis city limits.

ICLEI's Five-Milestone Process

ICLEI—Local Governments for Sustainability's five-step methodology provides a simple, effective, standardized means for communities to reduce emissions from both government operations and the community as a whole. The steps can be worked on concurrently, but each should be considered separately when developing a local action plan.

- ***Milestone One:*** *Conduct a baseline emissions inventory and forecast.*
- ***Milestone Two:*** *Establish an emissions reduction target for the forecast year.*
- ***Milestone Three:*** *Develop a local climate action plan to implement actions that reduce GHG emissions.*
- ***Milestone Four:*** *Implement the climate action plan.*
- ***Milestone Five:*** *Measure, verify and report performance.*

Reduction Goals

With completion of the community greenhouse gas inventory, Corvallis achieved Milestone 1 in the widely endorsed climate action planning process outlined by ICLEI—Local Governments for Sustainability. The City can now use the inventory for what it is intended—establishing a reduction target (Milestone 2) that reflects the baseline year (2012). Because the CAP Task Force worked concurrently on researching a reduction target and developing this climate action plan (Milestone 3), members used as working assumptions two goals from the City of Eugene's *Climate and Energy Action Plan 2013 Progress Report:*

1. Reduce community-wide greenhouse gas emissions by 10 percent below 1990 levels by 2020 and at least 75 percent below 1990 levels by 2050.
2. Identify strategies that will help the community adapt to a changing climate.

Eugene's 2013 GHG emissions reduction goal matches Oregon's stated GHG reduction targets from House Bill 3543, which reflected scientific research available in 2007. However, the scientific community now recommends that industrialized countries reduce their absolute GHG emissions 85 percent by 2050 relative to a 2010 baseline.

Since the base year for the Corvallis community inventory is 2012, the target year for Corvallis is 2053 for an 85 percent reduction compared to a base year. With community GHG emissions of 1,257,115 MT $CO2_e$ in 2012, Corvallis needs a year-over-year average reduction of 4.52 percent to meet the 2053 target. Assuming the interim goals of 2020, 2030, and 2050, Corvallis might set the following targets:[17]

- **2020:** MT $CO2_e$ ~ 868,185, cumulative reduction of ~31% of base
- **2030:** MT $CO2_e$ ~ 546,587, cumulative reduction of ~56.5% of base
- **2050:** MT $CO2_e$ ~ 216,647, cumulative reduction of ~82.8% of base
- **2053:** MT $CO2_e$ ~ 188,567, cumulative reduction of ~85% of base

The CAP Task Force is continuing to test reduction target models and underlying assumptions, but the above targets show the magnitude of the reductions required. Once targets are established, the actions outlined in this plan can be assessed for the impact they may have in helping to meet the targets. This will put Corvallis on the road to implementing carbon emissions reduction activities (Milestone 4) and determining how to evaluate our progress (Milestone 5).

Objectives and Actions

The strategies are divided into six topic areas. The first four are the primary targets for greenhouse gas emissions and fossil fuel reductions, and the last two focus on actions necessary to adapt to climate change. Please note that the actions in each area are not organized by priority. The first action in each section is not necessarily the most important, nor is the last the least important. Terms in *italics* are defined in the glossary located in Appendix H.

- **Buildings and Energy** looks at energy used in residential, commercial, and industrial buildings in Corvallis. This section includes recommendations to reduce energy use in existing buildings and new construction, expand use of renewable energy, and prepare buildings for climate change.
- **Food and Agriculture** includes everything related to our food production, delivery, distribution, and waste disposal. This section includes recommendations to reduce consumption of meat and dairy foods, reduce greenhouse gas emissions associated with agriculture and food waste, protect regional farmland, increase home- and locally-grown foods, and prepare our food systems for an uncertain future.

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[17] These targets were derived using the Autodesk City Finance Approach to Climate-stabilizing Targets ("C-FACT") methodology. Autodesk's open-source methodology is science-driven, considers economic factors, and compatible with standard protocols for carbon accounting. For more information, see: http://static-dc.autodesk.net/content/dam/autodesk/www/sustainability/docs/pdf/An_Openly_Available_Method_for_Setting_Science_Based_GHG_Targets_for_Cities-ADSK_White_Paper-approved_with_links.pdf

- **Land Use and Transportation** considers the use of land and the transportation of people and goods. This section includes recommendations to increase urban density and mixes of *land use* and a focus on improving systems for bike, pedestrian, and transit.
- **Consumption and Solid Waste** looks at the lifecycle of consumer goods from extraction of raw materials to manufacturing, packaging, distribution, product use and finally, disposal. This section includes recommendations to reduce greenhouse gas emissions associated with consumption of goods, improve recycling and composting, improve municipal purchasing practices, and adapt consumption strategies based on new findings.
- **Health and Social Services** addresses mental and physical health care and assistance programs for disadvantaged populations. This section contains recommendations to prepare health and social systems for a different future and reduce the impacts of climate-related disasters.
- **Urban Natural Resources** considers the soil, air, water, plants, and animals of our city. This section contains recommendations to manage land, trees, and water for multiple benefits, update resource management plans, improve access to natural resource data, and expand drinking water and stormwater management programs.

What Happens Next?

This climate action plan is a dynamic, living document. The Climate Action Plan Task Force understands—and desires—that it be scrutinized and revised because developing a first climate action plan is just a step in what will be a decades-long series of climate action planning exercises. As spelled out in the CAP Scope of Work for the Urban Services Committee, "The endgame is not the plan—it's the implementation of the plan."

The Corvallis CAP establishes general directions and offers specific actions over the next three to five years, but the scientific and general community's understanding of climate and energy challenges are evolving rapidly. Changes in community priorities, energy-saving technologies and opportunities, and state or federal rules for emissions will require the goals and objectives of this plan to be reviewed and updated on a regular basis.

However, this raises some very important questions, namely: Who or what organization is going to be the steward of the plan? Stewardship would include, but is not limited to:

- Conducting future GHG inventories—municipal and community—on a regular basis.
- Overseeing implementation of action items in the CAP.
- Monitoring and measuring progress.
- Keeping records on the metrics of the unfolding plan to track projects.
- Reporting on how well actions are meeting their intended emissions reduction goals.
- Identifying and seeking funding for actions, where necessary.

The CAP Task Force has undertaken this effort to develop a community climate action plan because it understands that City staff resources are limited. That said, local governments necessarily have the leading role in many areas, such as guiding local land use policies; shaping new development; strengthening building codes; investing in transportation systems and infrastructure; working with

utilities; and managing parks, urban forests, natural areas, and watersheds. In addition to eventual adoption of a CAP, we would expect the City of Corvallis to commit to:

- Integrating CAP strategies and actions into City operations and existing plans (e.g., Transportation Master Plan, Comprehensive Plan, Economic Development Plan) and the update of the 2020 Vision Statement.
- Evaluating and reporting on community carbon emissions, re-examining goals, and identifying new actions on a regular basis.
- Devoting staff resources as required to accomplish the above tasks. The costs need to be built into the budget, and the responsibility needs to be in employee job descriptions.

Funding

Many of the action items recommended in this plan align with work already underway across the City organization in solid waste management, stormwater management, urban forestry, and other existing City programs. Moreover, many are intended to be part of the work that the City will be doing when it updates the Comprehensive Plan and Transportation Master Plan and therefore are likely to require a redirection of City staff rather than additional budget.

The CAP Task Force plans to conduct further research to clarify some of the relative costs and benefits of actions in this plan. It will compile a table of the actions and associated targets that includes estimated financial impacts and estimated greenhouse gas reductions and include it in the final draft of the CAP that it presents to the City Council in January.

The CAP Task Force also is willing to research funding opportunities and has already identified some in the course of its work. Understanding that seeking and applying for grants can be very time-consuming, Task Force members are willing to work with City staff to take advantage of these opportunities. Some possibilities include:

- **STAR Communities.** Sustainability Tools for Assessing and Rating Communities is a Washington, DC-based 501(c)(3) nonprofit organization that works to evaluate, improve and certify sustainable communities. The STAR Communities Leadership Program provides extensive staff support and services to a cohort of communities as they work through the STAR Community Rating System measuring local sustainability. In the past two years, 58 cities and counties have participated in the Leadership Program. To date, 20 have achieved STAR certification and 15-18 more are expected to certify this winter. Applications for the Spring 2015 cohort are open now and are due January 16, 2015. The one-year program costs $7,500 and begins March 1, 2015. STAR Communities will make available a limited number of need-based program fee scholarships.
- **Climate Action Champions.** In October, the Obama Administration announced this competition to identify, showcase, and invest in up to 15 local and tribal governments across the country that demonstrate an ongoing commitment to cutting carbon pollution and preparing for the impacts of a changing climate. The competition is administered by the U.S. Department of Energy (DOE) and implemented in collaboration with a broad range of Federal agencies. “Champions” are eligible for technical assistance, mentorship, peer-to-peer learning, and climate tools and will be promoted as best practices to other

communities seeking to do similar work. [18] The competition has closed for this year, but it is likely to be renewed in 2015.

- **Partnership for Sustainable Communities.** Since 2009, this joint program of the U.S. Department of Housing and Urban Development, U.S. Department of Transportation, and the U.S. Environmental Protection Agency has been helping communities strengthen environmental protection, economic competitiveness, and climate *resilience*. By bringing together communities that have experience with long-range planning and providing grants and other assistance, the Partnership works to coordinate federal housing, transportation, water, and other infrastructure investments to make neighborhoods more prosperous, allow people to live closer to jobs, save households time and money, and reduce pollution.
- **100 Resilient Cities.** Pioneered by the Rockefeller Foundation, 100RC is dedicated to helping cities around the world become more resilient to physical, social and economic challenges. 100RC supports the adoption and incorporation of a view of resilience that includes not just shocks – earthquakes, fires, floods, etc. – but also stresses, such as high unemployment; an overtaxed or inefficient public transportation system; endemic violence; or chronic food and water shortages. Cities in the 100RC network are provided with the resources necessary to develop a roadmap to resilience along four main pathways: 1) financial and logistical guidance for establishing a Chief Resilience Officer in city government; 2) expert support for development of a resilience strategy; 3) access to solutions, service providers, and partners from the private, public and NGO sectors who can help develop and implement the resilience strategy; and 4) membership in a global network of member cities who can learn from and help each other.

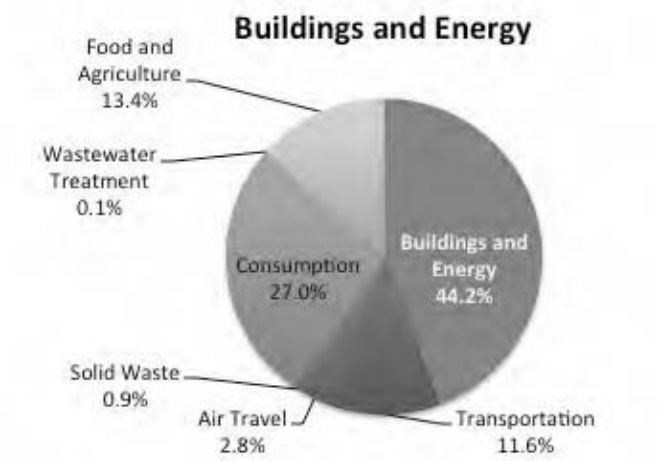
[18] "Obama Administration Announces Climate Action Champions Competition to Recognize Climate Leaders Across the United States," White House Office of the Press Secretary, October 01, 2014: http://www.whitehouse.gov/the-press-office/2014/10/01/obama-administration-announces-climate-action-champions-competition-reco

Buildings and Energy

"At about 44 percent, emissions associated with building energy account for the largest part of the Corvallis community's carbon footprint."

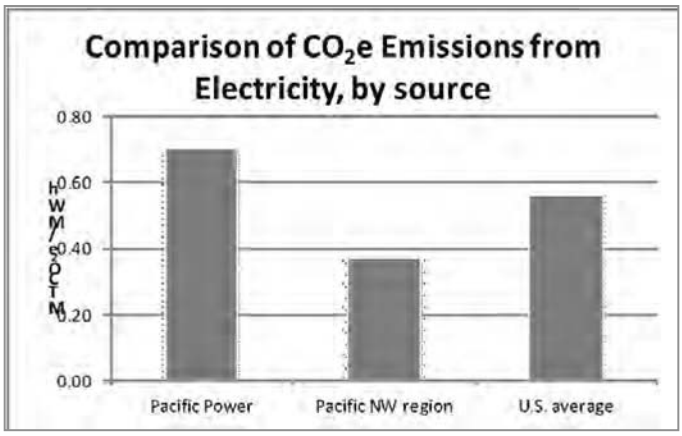
What is the Buildings and Energy Action Area?

This section focuses on all the energy used to provide heating, cooling, light, and power in residential, commercial and industrial buildings in Corvallis and on the resulting greenhouse gas (GHG) emissions. The emissions from this sector come from a wide variety of uses, such as operating commercial businesses (e.g., supermarkets), producing industrial products (e.g., operating equipment), to powering events (e.g., lighting at Reser Stadium), as well as the traditional heating/cooling/power needs of homes, apartments, office buildings, etc.

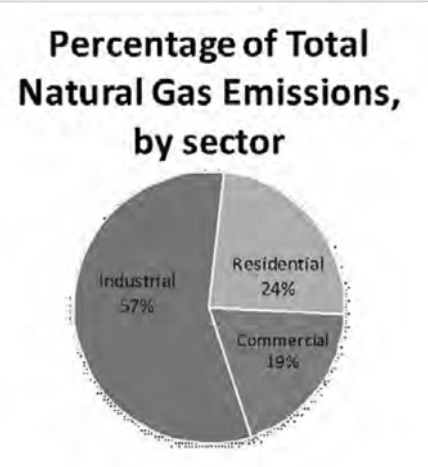


How Do Buildings and Energy Contribute to GHG Emissions?

Corvallis purchases electricity from Pacific Power, an investor-owned utility, and Consumers Power, Inc. a privately owned cooperative operated on a non-profit basis. Pacific Power, which provided over 91% of the electricity used in the community in 2012, generates 67% of its electricity from coal and 13% from natural gas.[19]. This heavy reliance on fossil fuels contributes to a higher percentage of emissions. Consumers Power purchases electricity from the Bonneville Power Administration, which markets electrical power generated from hydroelectric, nuclear, and renewable resources. The chart at right compares emissions from electricity by source. Both utilities provided usage data for the inventory year for the community, but did not break it down by residential, commercial, and industrial users.



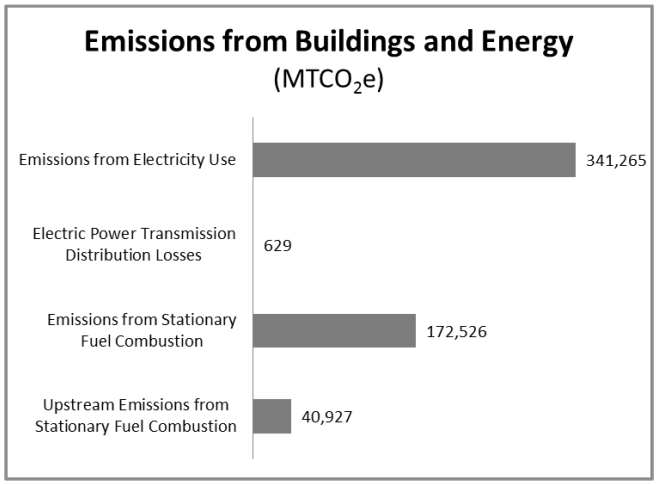
[19] Oregon Department of Energy's "Where does Oregon's Electricity come from?" website http://www.oregon.gov/energy/pages/oregons_electric_power_mix.aspx



Multiple types of fuels combust to produce heat for space heating, process heating, and cooking, but natural gas is by far the most widely used in Corvallis. Natural gas is cleaner than coal or oil combustion, but it still produces significant greenhouse gas emissions. Northwest Natural Gas, an investor-owned utility, is the sole supplier to the Corvallis community and provided usage data for the greenhouse gas inventory. Usage data for other fuel types, from *biomass* fuels such as wood to petroleum products such as distillate fuel oils, are difficult to determine and were not included in the inventory.

What Part of Corvallis's GHG Footprint Comes from Buildings and Energy?

At about 44 percent, emissions associated with building energy account for the largest part of the Corvallis community's carbon footprint, according to the greenhouse gas inventory. Emissions from electricity use and electric power transmission and distribution losses account for 27.2 percent. Emissions from the community's use of natural gas and the energy used to extract, process and deliver natural gas account for 17 percent.[20]



How Will Climate Change Affect Buildings and Energy?

More intense storms, reduced snowpack, lower summertime stream flow, and more extreme summertime heat events will have tangible impacts on buildings and energy resources. The community should prepare for unexpected emergencies that include interruptions in utilities, supplies, and food. A checklist for this topic would include:

- Ensuring that building codes allow and encourage practices such as: rainwater collection and storage, safe *greywater* reuse, composting toilets, and solar access for photovoltaics.
- Working with utility companies to develop local grid and storage capacity for electricity (especially that which is locally generated renewably produced) and natural gas.

[20] The use of energy associated with the operation of the City's water delivery facilities, the use of potable water, and the generation of wastewater by the community are all included in the community greenhouse gas inventory under electricity use. Process emissions associated with generation of wastewater by the community and from operation of wastewater treatment facilities are considered separately. Wastewater treatment processes create emissions when microorganisms degrade the soluble organic material in wastewater under anaerobic conditions, creating methane, nitrous oxide, and carbon dioxide.

- Promoting structural safety codes for wildland fires.
- Developing and publicizing emergency shelter centers.

Objectives and Actions for Buildings and Energy

OBJECTIVE 1: Reduce energy consumption by 50% by 2030 through conservation and efficiency.

Actions to be completed by the end of 2016

- 1.1. Support the Corvallis Environmental Center and Georgetown University Energy Prize group and others in their continuing work to change behaviors in residents to minimize carbon footprints.

Actions to be completed by the end of 2020

- 1.2. Require all buildings to maximize conservation and efficiency of energy.
    - 1.2a) Rewrite building codes for new construction to require lowest carbon footprint construction and operation, for example using guidelines and standards from *Architecture 2030*, the *Energy Trust of Oregon*, or *LEED*.
    - 1.2b) Require all existing buildings, especially rental properties, be retrofitted to meet stringent energy conservation standards such as those mentioned in the Oregon Global Warming Commission's Roadmap to 2020.
    - 1.2c) Direct the building of smaller homes that use less energy to operate and fewer building materials to construct, both for new construction as well as density and infill of existing buildings.
- 1.3. Require energy performance ratings for all homes so that owners, tenants and prospective buyers are informed before making purchasing or rental decisions.
- 1.4 Require energy performance benchmarking and promote improved operation and maintenance practices for all commercial buildings and also (separately) for multi-family buildings.
- 1.5. Establish practices that reduce the use of potable water for non-potable purposes, such as landscaping, washing, and toilets; reduce volumes of *wastewater* and stormwater entering the treatment center; recharge ground water through rainwater collection, *rain gardens*, permeable pavers, etc.
- 1.6. Work with utility companies via franchise agreements to structure rates to incentivize reduced use, require equipment with maximize efficiency, and require conservation voltage reduction from Pacific Power.

OBJECTIVE 2: Transition to 100% renewably produced energy by 2030.

Actions to be completed by the end of 2016

- 2.1. Monitor and track the growth of alternative renewable energy in Corvallis – make it a community project with regular updates on progress.
- 2.2. Make the pursuit of renewable energy installations by residents, businesses, and municipal buildings a primary focus of the Economic Development office under the

principal of import substitution. Develop business linkages so that all imported energy can be renewably sourced. Begin immediately.

- 2.3. Assist and promote the development and installation of *community scale renewable energy* projects such as solar co-ops and community investment solar projects such as Seeds for the Sol.
- 2.4. Support efforts of regional, statewide and national groups like *350.org* and *Citizen's Climate Lobby* to pass legislation in support of reduced greenhouse gas emissions.

OBJECTIVE 3: Adapt to climate change disturbances (ongoing).

Actions to be completed by the end of 2016

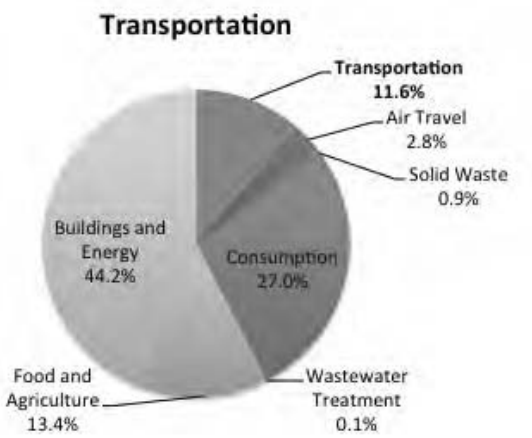
- 3.1. Lobby for changes at the state level to amend existing building codes to allow and encourage practices such as: passive solar design, rainwater collection and storage, safe gray water reuse, solar clothes drying, composting toilets, and solar access for photovoltaics.
- 3.2. Through franchise agreements, work with utility companies to develop local *smart grid* technology and storage capacity for electricity (especially that which is locally generated renewably produced) and natural gas.
- 3.3. Develop and publicize emergency shelter centers.
- 3.4. Revise community development plans to more strongly favor walkable neighborhoods and infill density both in existing built environment and also in new development.

Land Use and Transportation

"Readjusting the Corvallis GHG inventory to take into account the embodied emissions of personal motor vehicles and commuter trips indicates that personal motor vehicles account for at least 28% of our City's GHG emissions."

What is the Land Use and Transportation Action Area?

This section considers how the community is spatially organized and how that organization affects transportation needs. The transportation systems in this section are those that move people and local freight: passenger vehicles, bicycles, mass transit systems, air transport and local freight distribution systems, and the roads and other infrastructure required for these systems.



Although a particular land use may directly impact consumption of fossil fuels and emission of GHGs, in most cases, the more important impacts of land uses are on the demand for transportation systems. Land use directly impacts transportation system needs, and transportation systems contribute significantly to fossil fuel consumption and GHG emissions. As the two are so connected, this plan will consider them together and outline action items for each that will affect the other.

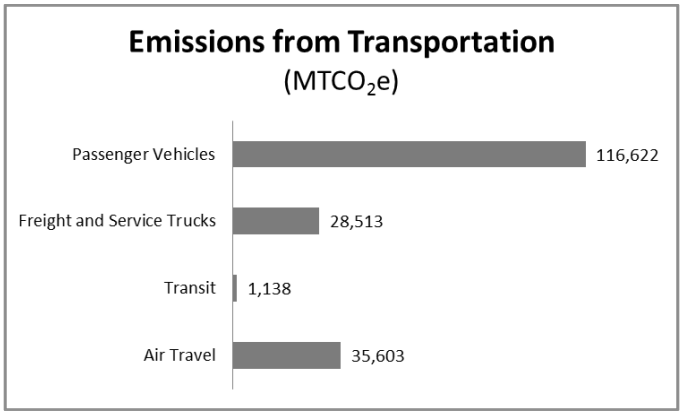
How Does Land Use and Transportation Contribute to GHG Emissions?

GHG emissions related to transportation fall into two main categories: transportation of people and transportation of goods. Here we focus on transportation of people because the transportation of goods falls more appropriately under Food and Agriculture and Consumption and Solid Waste. Hereon in, we will refer to the transportation of people simply as transportation. Further, we focus on those GHG emissions that are within the control of the City of Corvallis, namely those GHGs caused by transportation for residents of Corvallis, commuters to Corvallis, students in Corvallis and visitors to Corvallis.

Transportation produces GHGs through direct emissions (during the transportation itself) and indirect emissions (in the production of the vehicles used for transportation). Transportation decisions are also affected by land-use decisions. Lack of nearby services causes people to travel further to meet their needs. Resistance to medium- and high-density housing causes urban sprawl, increasing the distances that people need to travel for work, school and errands. The green belt around our city physically prevents this sprawl, but simply means that our growth is diverted to nearby "sleeper" communities (e.g., Albany and Lebanon).

What Part of Corvallis's GHG Footprint Comes from Transportation?

In short, at least one third of our GHG emissions are due to transportation. In the recent GHG inventory for Corvallis, we see that transportation is responsible for 11.6% of emissions and 64% of those emissions are from our personal motor vehicles (PMVs). However these numbers include neither *vehicle-miles traveled* outside the city limits nor the GHG emissions released during the manufacture of vehicles. Back of the envelope calculations show us that 11.6% is a significant underestimate of the transportation GHGs for which Corvallis residents, employers and policies are responsible.



More than 17,000 people commute from surrounding communities to work in Corvallis, while nearly 10,000 people live in Corvallis but work in other cities.[21] Almost all of these people commute by car. The reasons for these car commuters are largely under the control of Corvallis: housing is expensive and lacking in Corvallis as compared with nearby communities, and transportation between Corvallis and neighboring towns is infrequent. Adding these commuter miles to the Corvallis community's GHG tally nearly doubles the emissions estimated in the inventory (using very conservative estimates for distance traveled).

More than 20,000 students attend Oregon State University and most bring their cars. Another 8,000 cars come into Corvallis for OSU athletic events, often driving from Portland because there are few options for intercity public transportation and those that exist are expensive. While Albany has more than a dozen buses or trains to Portland, Salem and Eugene every day, Corvallis has only three—one can take up to 3 hours (Valley Retriever) and the other two (Greyhound) travel the length of the coast, frequently do not have seats available, and are rarely on time. Transit between Corvallis and Albany does not link up with the transit hub that Albany has become. Rough estimates of GHG emissions due to student and OSU game day travel could easily be as much as the commuting miles of the Corvallis workforce.

[21] "Planning how we'll get around," *Corvallis Gazette-Times*, January 7, 2014: http://www.gazettetimes.com/news/local/planning-how-we-ll-get-around/article_e6d72e56-771f-11e3-9dfd-001a4bcf887a.html.

The *embodied emissions* from the manufacturing of a car can be as much as the GHG emitted by the car's travel[22], which is why this plan does not advocate for mass expansion of electric vehicles as a solution to the transportation question. Moreover, the GHGs from the manufacture of an electric vehicle and its batteries are nearly double those of a conventional vehicle[23]. These GHGs are counted in the "food and goods" category of the Corvallis community inventory. Transferring this to transportation and adding the emissions from the manufacture of cars that commute to Corvallis would add about the same amount of GHG emissions as those from miles traveled within city limits.

Current State of Corvallis

Readjusting the Corvallis GHG Inventory to take into account the embodied emissions of personal motor vehicles and commuter trips indicates that personal motor vehicles account for at least 28% of our City's GHG emissions, nearly 2.5 times that of the inventory's estimate. This does not include the GHGs emitted by non-work trips between Corvallis and locations beyond.

Corvallis has a relatively high proportion of bicycle commuters (9%). However, in the League of American Bicyclists' recent re-certification of our Gold-level status (one level below the top, Platinum, which Portland, Boulder and Davis have earned), our city was warned that we have stagnated and risk losing our *Bicycle Friendly Community* status. Our ridership growth over the past 12 years has been 29%, as compared with 61% growth nationally and 85% among other Bicycle Friendly Communities. Corvallis has made little investment in bicycle infrastructure and still does not have protected bike lanes or bicycle boulevards, which are key to increasing ridership.

Corvallis also boasts high in-town transit ridership, with more than one million rides per year (compared to Albany's 400,000 per year), largely thanks to its fare-less system. Because of this high transit ridership, Corvallis is eligible for federal grants that will allow Corvallis to expand service. However, as already noted, intra-city transit to and from Corvallis is inadequate. Despite the high number of commuters to Corvallis from Albany, there are few direct trips per day; there are no direct buses to Lebanon, another common commuter origin.

How Will Climate Change Affect Land Use and Transportation?

Studies of potential climate change scenarios for the Willamette Valley indicate that the Corvallis community may experience more severe storm events and resultant flooding, as well as an increase in forest fires. This analysis suggests that transportation systems will be impacted, especially roads and railroads, and those along rivers and streams, or on unstable slopes, will be especially vulnerable. Increased storms and wildfire smoke may also affect air travel and transport of goods. To minimize the impacts to the transportation system, planning and design efforts must consider these scenarios.

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[22] CoolClimate Carbon Footprint Calculator: http://coolclimate.berkeley.edu/carboncalculator.
[23] "CMU/Ford study assesses optimal mix of conventional, hybrid, plug-in hybrid and electric vehicles for minimizing GHG and cost," Green Car Congress, 31 October 2012: http://www.greencarcongress.com/2012/10/traut-20121031.html.

In addition, the Willamette Valley could experience an influx of *climate refugees*—people moving away from areas that have become less livable due to sea level rise, severe storms, or prolonged drought. Land use and transportation planning processes must consider possible impacts on the community.

Objectives and Actions for Land Use and Transportation

As climate change progresses, tariffs will be placed on the causes, including fuel. This will increase the cost of travel in conventional and hybrid vehicles as well as the cost of purchasing those vehicles. However, our actions must not wait until this is the case, as low-income families and individuals will continue to bear a disproportionate cost of transportation and housing. Our actions center around three main objectives: increasing the use of active and public transportation, reducing the reliance and ownership of personal motor vehicles, and reducing the distances to destinations that residents need to reach.

The three objectives below are each quantifiable. We recommend a target date of 2030, but these metrics should be evaluated at least every three years to ensure progress is being made.

OBJECTIVE 4 Increase biking, walking, and transit use. By 2030, 80% of trips under 2 miles to be made without a car and 75% of commuters to Corvallis will do so by mass transit.

Actions to be completed by the end of 2016

- 4.1. Modify the transportation plan to prioritize the needs of bicyclists and pedestrians.
- 4.2. Add barriers between bike and vehicle lanes (e.g., painted buffers, parking lanes, or concrete).

Actions to be completed by the end of 2020

- 4.3. Establish motor vehicle-free streets downtown, with exceptions for transit, deliveries (possibly with time-of-day limitations), emergency vehicles, disability access.
- 4.4. Create a network of bicycle boulevards that allow for nearly stop-free bicycle trips between all destinations in town, have low motor-vehicle volumes and speeds. For example, by forcing turns for motor vehicles and upgrading crossings of arterial streets to 4-way stops or cyclist-activated hawk-crossings. Roll these out *immediately* using low-cost infrastructure including simple through-way barriers,[24] painting bicycle/pedestrian crosswalks and signage. Consider community-sponsored installments for exhibition purposes.

[24] "Going Street bike boulevard gets crossing help with new median," BikePortland.org, November 17, 2011: http://bikeportland.org/2011/11/17/portlands-best-bike-boulevard-just-got-better-62240

- 4.5. Expand the Corvallis Transit System; increase the frequency of trips, expand routes, extend schedule into evenings and Sundays. Consider expanding on-demand "dial-a-ride," perhaps by first extending service to car-free households.

Actions to be completed by 2030

- 4.6. Develop separated multi-use paths between Corvallis and neighboring communities and areas such as Albany, Lebanon, Adair and the airport.

OBJECTIVE 5: Decrease ownership of personal motor vehicles. By 2030, 40% of households will be car-free and 40% of households will have only one car.

Actions to be completed by the end of 2016

- 5.1. Establish a city-wide car sharing infrastructure. Either use an existing car-sharing company (such as GetAround) or develop a city-owned infrastructure. Proceeds from the car share could fund other parts of this action plan.
- 5.2. Create true transit-connections to bus and train departures at the Albany transit center.

Actions to be completed by the end of 2020

- 5.3. Create direct connections to popular destinations with seasonal timetables to support transportation of students and visitors to Corvallis.

OBJECTIVE 6: Create walkable and bikeable neighborhoods. By 2030, 90% of households will be within 15 minutes' reach of basic, daily non-work needs by bike or foot.

Actions to be completed by the end of 2016

- 6.1. Change zoning standards to allow neighborhood cafes, food stands, and small-business retail.
- 6.2. Change zoning standards to allow for increased housing density in urban core and transit corridors.
- 6.3. Reduce the width of neighborhood streets to calm traffic, increase water absorption and increase green space. Change city street standards to encourage this.

Actions to be completed by the end of 2020

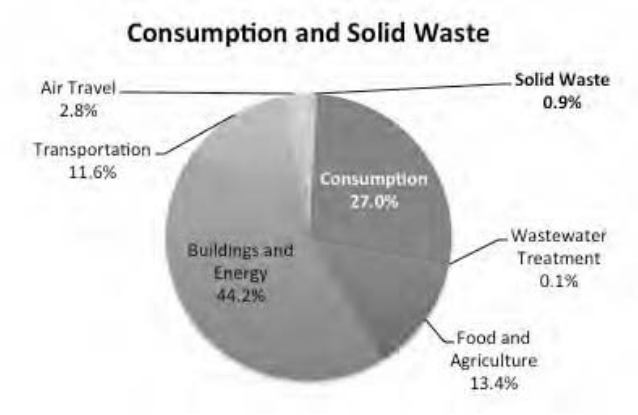
- 6.4. Develop high-quality medium and high-density owner-occupied and rental housing for all income brackets.

Consumption and Solid Waste

"Taken together, non-food consumption and solid waste are the largest source of emissions from the Corvallis community, just ahead of electricity use."

What is the Consumption and Solid Waste Action Area?

This section includes the entire *lifecycle* of the products we purchase and consume, whether local or imported. The lifecycle begins with the mining and extraction of the raw materials and includes other steps, such as manufacturing, packaging, transport and use. The lifecycle ends with disposal of each element of the product that remains.

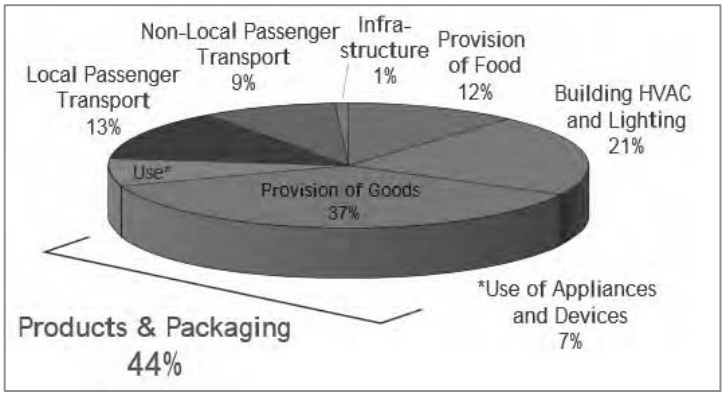


How Do Consumption and Solid Waste Contribute to GHG Emissions?

Consumption

Until recently, many greenhouse gas inventories focused on the direct emissions that come from the use of fossil fuels. Using this methodology, the inventories have shown most emissions to come from transportation and electricity, overlooking what the fossil fuels are ultimately used for, which is quite often materials extraction, manufacturing, packaging, and distribution of consumer goods.

However, according to an EPA report from 2009, *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices*, non-food products account for some 37% of our greenhouse emissions[25]. The Products Policy Institute took this a step further and figured in imports in a 2009 report titled, *Products, Packaging and US Greenhouse Gas Emissions*. They found



Products Policy Institute, 2009

[25] *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices,* U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response, September 2009, http://www.epa.gov/oswer/docs/GHG_land_and_materials_management.pdf

that 44% of the US carbon footprint could be attributed to non-food products[26]. That is roughly equal to the categories of building HVAC (Heating, Ventilation, Air Conditioning) and personal transportation combined. If you also add in provision of food, and landfill emissions of discarded products and associated packaging, Consumption and Solid Waste become the largest source of our emissions.

Solid Waste

GHG inventories include the emissions from waste management activities. This includes emissions from the process of collection, transportation and processing of solid waste. The majority of emissions in waste management are from landfill emissions, which result from the release of methane during the decomposition process. Solid waste generated in Corvallis is deposited at the Coffin Butte Landfill.

In addition to calculating emissions from the waste itself, the method used to determine the Corvallis community's emissions includes the transport and process emissions that come from powering the equipment to manage the landfill. The emissions related to solid waste collection and transportation are accounted for in the Freight and Service Trucks emissions and are not itemized separately. Because of the lack of widely accepted and standardized data and guidance, the Protocol does not include methodologies to estimate emissions from composting.

What Part of Corvallis's GHG Footprint Comes from Consumption and Waste?

According to the community greenhouse gas inventory, about 1 percent of emissions are associated with solid waste, and 27 percent can be attributed to non-food goods and services. This aligns closely with the Metro Regional Government's estimate in 2010 that provision of goods (excluding food) accounts for 25 percent of GHG emissions in the region and solid waste accounts for 1.3 percent.[27] Taken together, non-food consumption and solid waste are the largest *source* of emissions from the Corvallis community, just ahead of electricity use.

[26] *Products, Packaging and US Greenhouse Gas Emissions,* Product Policy Institute, http://www.productpolicy.org/ppi/general/PPI_Climate_Change_and_Products_White_Paper_September_2009.pdf

[27] "Regional Greenhouse Gas Inventory: The Carbon Footprint of Residents and Businesses Inside the Portland Metropolitan Region," Metro Regional Government, April 2010.

Consumption

The Corvallis community greenhouse gas inventory uses the Government Supply Chain emissions estimate from the 2008 City of Corvallis Greenhouse Gas Inventory for Municipal Government Operations. To estimate household consumption for the community, City staff used the CoolClimate Carbon Footprint Calculator[28], but omitted some categories in the calculator to avoid double counting of emissions. For example, natural gas emissions are already included in the ICLEI Protocol in the category for Stationary Fuel Combustion.

The Corvallis GHG inventory includes food in its estimate of household consumption, whereas this Climate Action Plan breaks out Food and Agriculture as a separate topic area. Therefore, this Consumption and Solid Waste topic area does include food in its Household Consumption category. The table below shows the categories that were and were not included as Household Consumption emissions sources.

Included in Household Consumption	Not included in Household Consumption
Car manufacturing	Car fuel
Construction	Water
Goods	Natural gas
Services	Electricity
	Other fuels
	Food
Note: Air travel is included as a separate category rather than as a part of Household Consumption.	

Solid Waste

Emissions from community-generated solid waste sent to the landfill and process emissions associated with landfilling were estimated from the waste tonnage reported in Republic Services 2012 Annual Report.

How Will Climate Change Affect Consumption and Solid Waste?

To the extent that climate change impacts energy production and distribution and food and agriculture, it may increase economic hardships and food insecurity. We can prepare by establishing strong community connections that encourage sharing of resources, especially those that ensure that people receive adequate amounts of food.

[28] CoolClimate Network: http://coolclimate.berkeley.edu

Objectives and Actions for Consumption and Solid Waste

OBJECTIVE 7: By the end of 2020, the recycling rate for Corvallis will be 75 percent.

Recycling rate is defined as total pounds of waste recovered (recycled, composted or reused) divided by the total waste generated (recovered and landfilled). The baseline for this action is the 2007 rate of 45.2%. This objective reflects the goals of the Corvallis Sustainability Coalition Action Plan of 2013.

The goal will be achieved by increasing collection yard waste and compost through existing curbside collection programs and diverting landfill bound construction waste. Because the Corvallis Sustainability Coalition's Waste Prevention Team will be offering the community and business owners education on composting and recycling, this plan additionally proposes that policies be put in place to make composting and recycling mandatory.

Actions to be completed by the end of 2016

- 7.1. Research and implement ways to make recycling easier for people. Examples include providing pictures on bins so people know which bins to use and more recycling and compost bins available in public spaces.
- 7.2. Provide education and resources to construction companies about recycling and reuse opportunities for construction waste.
- 7.3. Provide education and waste audits for business owners to increase compost and recycling rates and provide financial incentives.
- 7.4. Research policies requiring composting and/or recycling as currently practiced in cities such as San Francisco and Seattle and implement a similar policy in Corvallis.

Actions to be completed by the end of 2020

- 7.5. Research mandatory composting and/or recycling programs of other cities; enact a policy with increased requirements and penalties.
- 7.6. Research construction and demolition debris ordinances in other cities; enact a similar policy requiring recycling and/or reuse of these materials to divert them from the landfill.

OBJECTIVE 8: Reduce total solid waste generated by 25 percent by the end of 2020.

Total solid waste generated refers to both the amount of materials sent to landfills and the amount of materials recovered (i.e., recycled, composted, converted to energy or otherwise put to a use other than the original intended purpose). It can be valuable to look at total waste, which serves as a reflection of consumption rates. As stated above, consumption is a very large part of our carbon footprints. This is a bit different, but not contradictory to the Corvallis Sustainability Coalition's action plan, which calls for a 50% per capita reduction in landfill-bound disposals only.

Actions to be completed by the end of 2016

- 8.1. Use outreach programs to emphasize reducing consumption first, followed by reuse, *upcycling*, repair and finally choosing sustainable goods built to last.
- 8.2. Restructure the City franchise agreement to provide incentives to encourage waste

reduction (e.g., increase rates for high-volume customers).

- 8.3. Establish an education program to demonstrate how our consumption habits contribute to our carbon footprints. Encourage people to rethink the ideas of growth and economy.
- 8.4. Establish better ways of measuring consumption in Corvallis and incorporate into future greenhouse gas inventories.
- 8.5. Provide information to local manufacturers on reducing carbon footprint of items produced.
- 8.6. Identify high-carbon product categories and develop and disseminate information that will aid consumers and retailers in making purchasing decisions.

Actions to be completed by the end of 2020

- 8.7. Support State efforts to develop a consumption-based GHG inventory methodology and to adopt standards, incentives, and/or mandates for *carbon footprinting* and labeling of products.
- 8.8. Support State efforts to advocate for a carbon *price signal* across the life cycle of products and materials (either by an emissions cap and/or a carbon tax), including imports (border adjustment mechanism/carbon tariff if necessary).

Carbon footprints can be shared with customers either indirectly (on request, akin to a material safety data sheet) or via a carbon label (akin to a nutrition label) printed on the product or its packaging. Carbon footprinting and/or labeling is believed to reduce GHG emissions in several ways. First, as the producer examines the greenhouse gas emissions associated with a product, it gains better understanding of the causes of these emissions and opportunities to reduce them. Second, knowing that customers (consumers, other businesses) may use the carbon footprint (or label) in product selection, producers are incented to reduce their emissions. Finally, customers may use the footprint or label to reduce the GHG emissions associated with their own purchases.[29]

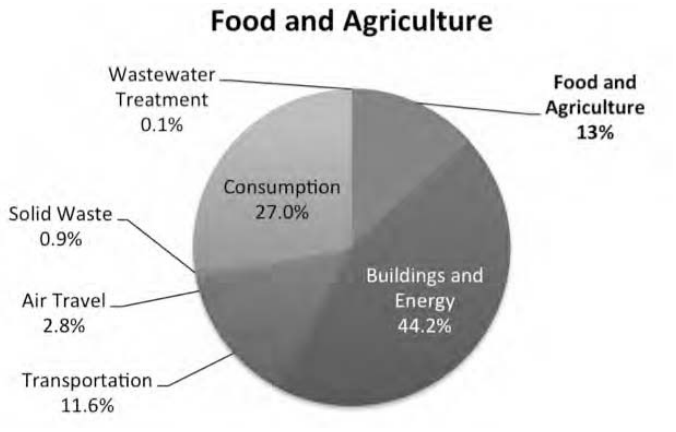
[29] "Materials Management Roadmap to 2020 Report to the Oregon Global Warming Commission," Materials Management Technical Committee of the Oregon Global Warming Commission, October 2010: http://www.keeporegoncool.org/sites/default/files/Materials%20Management%20Roadmap_092710.pdf.

Food and Agriculture

"Food production and processing is responsible for 83% of the average US household's footprint for food consumption."

What is the Food and Agriculture Action Area?

This section addresses the production, delivery, distribution, preparation, and disposal of food and beverages for residential, commercial and institutional use. Food and agriculture contributes to climate change and is also affected by climate change.



How Do Food and Agriculture Contribute to GHG Emissions?

Food and agriculture accounts for close to one-quarter of all GHG emissions globally, according to the IPCC's latest assessment report. The emissions in this sector come from such diverse sources as enteric rumination (*methane* emissions from livestock), farm management techniques (e.g., fertilizer application), processing and cooking, as well as transport of food products. A common misconception is that transportation of food (also called Food Miles) is responsible for the majority of food-related GHG emissions. Instead, food production and processing is responsible for 83% of the average US household's footprint for food consumption. GHG emissions from food production include those generated by energy use for farming equipment, manufacture of fertilizers, pesticides and other agricultural chemicals, production of animal feed, and methane generated by livestock animals and manure management. In fact, methane produced by livestock "enteric rumination" and farmers' management of manure account for about one-fifth of total food-related GHG emissions[30].

What Part of Corvallis's GHG Footprint Comes from Food and Agriculture?

The Corvallis community greenhouse gas inventory estimated emissions associated with the manufacturing and production of food consumed by Corvallis households. Using national average emissions per household data from the CoolClimate Carbon Footprint Calculator, the inventory found that household food consumption, production and disposal accounts for 13% of the community's GHG emissions. Emissions for food consumed by local government and businesses were not included in the estimate, nor were the emissions associated with landfilling or composting of food waste, so total food and agriculture emissions are likely higher.

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[30] "Food-Miles and the Relative Climate Impacts of Food Choices in the United States," *Environmental Science & Technology*, April 16, 2008: http://pubs.acs.org/doi/full/10.12021/es702969f.

How Will Climate Change Impact Food and Agriculture?

Climate change is expected to result in floods, drought, decreased snowpack, extreme heat, and wildfires, which will all impact food and agriculture. Some predicted effects in the Northwest include: a reduction in snowpack which will diminish water supplies for irrigation; damage to crops sensitive to higher day and nighttime temperatures; a longer growing season for some crops ; and different pest and disease pressures for crops and animals[31].

To the extent that climate change impacts energy production and distribution, food and agriculture might also be negatively impacted. Increasing costs for fuel, including diesel, gas and natural gas, would have a significant impact on the price of food. Transportation of freight via air and truck is expected to become more costly and to cause food prices to rise. Increased costs for fertilizer, animal feed, and processing will put upward pressure on food costs.

Objectives and Actions for Food and Agriculture

Various actions can be taken to reduce the GHG emissions related to food and agriculture, as well as adapt food systems for projected impacts of climate change. Priority mitigation and adaptation objectives for food and agriculture in the context of climate change include:

- Reduce consumption of carbon-intensive foods;
- Increase the percentage of food consumed in Corvallis that is grown, processed, or
- produced locally;
- Encourage the use of more sustainable production practices; and
- Minimize, reuse and recycle food waste

These strategies are further detailed in the Objectives and Actions that follow. These Objectives and Actions are not mutually exclusive and should be seen instead as very much working together. For example, a reduction in overall meat consumption is important (see Objective 1), but for meat that will continue to be consumed, it should be produced locally (see Objective 2) and as sustainably as possible (see Objective 3).

OBJECTIVE 9: Reduce consumption of carbon-intensive foods by 25 percent by 2020 and by 50 percent by 2030.

Growing evidence shows that the kind of food we eat makes a significant difference in the associated GHG emissions. The city and its residents must therefore reduce consumption of carbon-intensive foods, such as dairy products, red meat and highly processed foods. Shifting 13-15% of red meat and

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[31] *Preparing for Climate Change in the Upper Willamette River Basin of Western Oregon, Co-Beneficial Planning for Communities and Ecosystems*, The Resource Innovation Group, et al., March 2009: http://www.theresourceinnovationgroup.org/storage/willamette_report3.11final.pdf

dairy consumption to other foods would achieve the same GHG reduction as totally eliminating the transport of food (source).

Actions to be completed by the end of 2016

- 9.1. Establish quantitative metrics and a baseline for consumption of carbon-intensive foods.
- 9.2. Begin a community-wide campaign to encourage the public to choose less carbon-intensive foods as part of a climate-friendly lifestyle. Specifically encourage consumption of alternatives to red meat and dairy products, which are especially carbon-intensive.
- 9.3. Implement a "Buy climate-friendly" food purchasing policy for public institutions including city and county governments, schools, and hospitals.

Other Benefits
- Healthy people - Lower meat consumption has also been associated with better health outcomes for people.

OBJECTIVE 10: Increase the percentage of food consumed in Corvallis that is grown, processed, or produced locally (i.e., Benton, Lane, Lincoln, Linn, Marion, and Polk counties) to 40 percent by 2020, and to 75 percent by 2030.

Consuming food produced by local businesses or residents can reduce food-related emissions as well as improve resilience and community health. It is estimated that less than 10% of food consumed in Corvallis is grown, processed, or produced locally.

Actions to be completed by the end of 2016

- 10.1. Establish quantitative metrics and a baseline for consumption of locally sourced food.
- 10.2. Expand and promote community gardens on public and private lands including school campuses, City lands, and church properties.
- 10.3. Provide educational opportunities for residents, particularly school children, to learn local food growing, preparation and preservation skills.
- 10.4. Support the development of the South Corvallis Neighborhood Food Center.

Actions to be completed by the end of 2020

- 10.5. Model and promote edible landscaping. Plant non-*invasive* food-bearing trees and shrubs on public and private lands
- 10.6. Assess and amend City policies to ensure that they allow for, where appropriate, production of food within the city limits. Provide funding to Corvallis farmers' markets to increase shopping by low-income customers and to provide education on how to prepare local foods.
- 10.7. Support efforts to rebuild local food infrastructure such as flour mills and canneries.

Building Resilience
- Enhanced food security
- Stronger community connections
- Preserves agricultural land

Other Benefits
- Healthier people – physical activity from gardening; greater access to fresh fruits and vegetables
- Economic development

CURRENT HIGHLIGHT

Southern Willamette Valley Bean & Grain Project is rebuilding the local food system by stimulating the cultivation and local marketing of organically grown staple crops like beans and grains to provide a foundation for year-round food resources in the Willamette Valley.

OBJECTIVE 11: By 2030, all landowners in Corvallis and all farmers in the Willamette Valley will manage their lands using sustainable agricultural practices.

While most agriculture occurs outside Corvallis' urban areas, local governments and Corvallis residents can encourage the use of more sustainable agriculture practices through purchasing decisions, education, and advocacy.

Actions to be completed by the end of 2016

- 11.1. Encourage producers to transition to agricultural production methods that reduce GHGs by working with partners such as the Oregon Department of Agriculture, Oregon Tilth, Oregon State University Extension Service, and the Southern Willamette Valley Bean and Grain Project.
- 11.2. Incentivize projects that improve the diversity, drought resistance and emissions intensity of food crops grown in the upper Willamette Valley.
- 11.3. Encourage consumer purchases of products produced using more sustainable agricultural practices.
- 11.4. Require sustainable landscaping practices be used in City operations. Some of these practices include incorporating native and/or drought tolerant plants into landscaped areas and leaving grass clippings on lawns to return nutrients.
- 11.5. Partner with neighborhood associations to incorporate food production and maintenance into neighborhood parks and the Parks and Recreation Master Plan.

Actions to be completed by the end of 2020

- 11.6. Advocate for agricultural policies that promote or require more sustainable agricultural practices.
- 11.7. Provide new homeowners and property managers with resources about sustainable landscaping and permaculture practices.

Building Resilience

- Less reliance on fossil fuels for production

Other Benefits

- Improved water quality
- Improved wildlife habitat
- Reduced toxics exposure for consumers/farm workers/wildlife

OBJECTIVE 12: Reduce food waste by 50 percent by 2020, and to as close to zero as possible by 2030. Re-use/Recycle 50 percent of any food waste by 2020 and all food waste by 2030.

Roughly one third of the food produced in the world for human consumption is wasted (source). To reduce GHG emissions, it is necessary to work with all participants in the food system to minimize food waste. Any food waste that must occur should be re-used/recycled.

Actions to be completed by the end of 2016

- 12.1. Require or encourage all food businesses to compost.
- 12.2. Support efforts to recycle food waste for fuel/energy including cooking oil and locally produced biodiesel/*biofuels*.
- 12.3. Facilitate the sharing of best practices among restaurants, caterers and other commercial food preparation operations for minimizing and re-using/recycling food waste.
- 12.4. Support gleaning opportunities.

Actions to be completed by the end of 2020

- 12.5. Renegotiate the franchise agreement with Republic Services to make sure it maximizes residential reduction of food waste and maximizes composting participation.

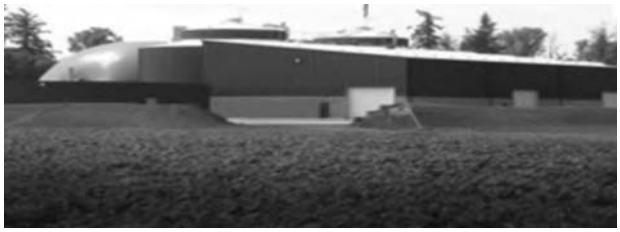
Building Resilience

- More efficient agricultural system – increasing food availability and conserving inputs, such as water.

Other Benefits

- Economic savings from maximizing use of food and food waste.

CURRENT HIGHLIGHT



A waste-digesting system or biogas plant for the community, such as the one that Stahlbush Island Farms operates, could provide methane from decomposing food waste for use as a locally generated fuel source.

Health and Social Services

"The various impacts of climate change have the potential to exacerbate social inequities and to intensify social service needs."

What is the Health and Social Services Action Area?

The Health and Social Services Action Area addresses the physical and mental health of people in our community, as well as assistance programs for disadvantaged populations. This section contains recommendations to prepare health and social systems for a different future and reduce the impacts of climate-related disasters.

How Are Health and Social Services Related to Climate Change?

Considering the enormity and the urgency of the problem, taking a "whole systems" approach to climate change is essential; the earth's ecosystem (air, water, soil, plants, animals, etc.) is best understood in the context of the interrelationships among these various components, rather than in isolation. Since human society is an integral part of the earth's ecosystem, addressing human health requires us to consider the health of the other parts of the system and the many ways in which humans affect and are impacted by the various parts of the system.

The environmental impacts of a changing climate will be matched by social challenges. The most recent IPCC report outlines the threats to Earth's life-support system, including "declines in regional food yields, freshwater shortage, damage to settlements from extreme weather events and loss of habitable, especially coastal, land. The list goes on: changes in infectious disease patterns and the mental health consequences of trauma, loss, displacement and resource conflict. In short, human-driven climate change poses a great threat, unprecedented in type and scale, to well-being, health and perhaps even to human survival."

With predictions of prolonged drought and increased temperatures in California and the Southwest, Oregon and the Willamette Valley in particular can expect a significant influx of "climate refugees." Increases in population and changing demographics will place added demand on food and water supplies precisely at a time when the Willamette Valley is expected to experience decreased rainfall, decreased snowmelt, and prolonged drought.

Low-income and vulnerable community members will face disproportionate impacts of climate change—rising energy and food prices and exposure to heat stroke in their homes, for example—while having fewer resources to respond to these changes. The various impacts of climate change have the potential to exacerbate social inequities and to intensify social service needs.

The IPCC points to three human impact categories in particular:

- nutrition deficits and impaired child development due to reduced food yields;
- injuries, hospitalizations and deaths due to intense heat waves, fires and other weather disasters; and
- shifts in the seasonal duration and spatial range of infectious diseases.

"There is also mounting evidence," the authors note, "of the adverse health consequences of workplace exposure to heat extremes, including reduced work capacity and productivity." At a minimum, the health and social service needs of the Corvallis community must be addressed at the county level. Ideally, a broader, more regional approach should be considered. One possible model is the City of Portland/Multnomah County "Climate Change and Public Health Preparation Plan."

How Will Climate Change Affect Health and Social Services?

The Benton County Health Department has developed a *Climate Change Health Adaptation Plan,*[32] which focuses on adaptation to the impacts of climate change that Benton County residents will experience. While the County plan acknowledges that reducing the drivers of climate change will require substantial reductions in GHG emissions on a global level, the plan also touches on mitigation opportunities at the local level.

The Benton County Climate Change Adaptation Plan describes how the different climate change impacts were chosen and how Benton County Health Department will gather data to help inform policy decisions that will lessen the future health impacts of climate change. The climate change impacts that were selected for the focus of the County's plan are:

- Drought and reduced summer water supply
- Extreme heat events
- Wildfire
- Extreme precipitation and flooding
- Ozone pollution
- Longer growing season

According to the County plan, the three areas that are expected to have the most negative health impacts on the community are extreme heat events, extreme precipitation and flooding, and wildfire.

The County plan outlines general actions that the following agencies and departments can take to help mitigate and address the impacts of climate change: Board of Commissioners, Community Development, Health Services, Public Works, and the Sheriff's Office.

Objectives and Actions for Health and Social Services

OBJECTIVE 13: By 2016, develop a City/County response to the human health and social service needs that result from climate change.

Since Benton County has taken the lead on addressing climate change, it is important for the Corvallis community to build on their efforts rather than to duplicate them. Collaboration among both elected officials and city/county staffs will be essential to creating an effective response to health and social service needs.

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[32] *Climate Change Health Adaptation Plan,* Benton County Health Department, July 26, 2013.

Actions to be completed by the end of 2016

- 13.1. Require all City departments to educate their employees about the County's *Climate Change Adaptation Plan* and to identify what role each department plays in addressing health and social service needs.
- 13.2. Create a process for City and County departments to work together on adaptation and mitigation strategies.
- 13.3. Develop a funding strategy to complement the funding needs outlined in the County plan.

OBJECTIVE 14: By 2020, engage all sectors of the community to work together to address human health and social service needs that result from climate change.

Adaptation to the impacts of climate change will require a shift in the way individuals and organizations operate, from working independently and in "silos" to adopting a more integrated, collaborative response. Just as individuals and organizations in short-term emergencies respond to assist those in crisis, community members and organizations will need to be prepared to cooperate across perceived boundaries to respond to climate-related events.

Actions to be completed by the end of 2016

- 14.1. Identify key organizations in the community (businesses, non-profits, educational institutions, faith communities, civic groups, and neighborhood associations) that can provide the broadest possible outreach to community members within its sector.
- 14.2. Create and distribute on an ongoing basis effective multi-media outreach tools related to preparedness for climate change.

Actions to be completed by the end of 2020

- 14.3. Use existing resources (e.g., Oregon Public Health Association) to develop at least one pilot project in each sector to demonstrate what will be needed to respond to climate-related emergences such as flooding, extreme heat, and wildfires. For example, a neighborhood association pilot project might demonstrate its readiness in case of food and water shortages, including a list of its most vulnerable members.

OBJECTIVE 15: By 2030, develop alternative systems that can be relied upon to meet basic needs such as water, food, energy, and transportation.

During climate-related emergencies, systems that meet people's most basic needs (water, food, shelter, etc.) may be disrupted or unavailable. Having alternative systems in place will be vital to the resilience of the community. The more people who are able to rely on alternative systems, the more able the community's health and social service networks will be to meet the needs of our most vulnerable populations.

Actions to be completed by the end of 2020

- 15.1. Support efforts to establish alternative water systems.
    - 15.1a) Encourage rainwater collection at residences, businesses, and institutions.
    - 15.1b) Begin to develop water purification systems on individual properties. For example, gravity-based micro-filter systems that can be installed on individual properties are designed to produce potable water without the need for external energy systems.
    - 15.1c) Begin to develop greywater systems for irrigation and other non-potable water needs.
    - 15.1d) Legalize and promote the installation of composting toilets.
- 15.2. Strengthen food sharing systems and facilities to handle increased demand.
    - 15.2a) Distribute the 2014 *Community Food Assessment of Benton County*, compiled by Ten Rivers Food Web, to educate community members about the current status of food security in the Corvallis area.
    - 15.2b) Increase support to existing food assistance programs.
    - 15.2c) Promote existing community programs that encourage the production, processing, storage, and distribution of homegrown food.
- 15.3. Support efforts that promote energy efficiency retrofits and installation of solar energy.
- 15.4. Increase access to transportation options.
    - 15.2a) Support land use planning policies that result in walkable, bikeable neighborhoods.
    - 15.2b) Expand the network of multimodal paths and public transit.

Urban Natural Resources

"Because natural resources are interdependent, many of the adaptation actions can achieve multiple goals.

What is the Urban Natural Resources Action Area?

In this plan, the term Urban Natural Resources covers the soil, air, water, plants, and animals in the suburban and urbanized areas of the community. These resources include stormwater, drinking water, and all the trees, shrubs, grasses and other plants that are scattered across the community on public and private lands.

How Are Urban Natural Resources Related to Climate Change?

Maintenance activities, which are necessary to protect and manage urban natural resources, produce some greenhouse gases; for example, when fossil fuels are used to power machinery and maintenance vehicles. However, the amount of GHG produced is a minute percentage of the total produced in the community. In fact, most inventories do not include natural resources as a source of greenhouse gas emissions, and many describe plants and soils as *carbon sinks*, a place where greenhouse gases, such as carbon dioxide, are taken out of the atmosphere by trees and other plants and stored in their leaves, stems and roots.

How Will Climate Change Affect Urban Natural Resources?

Probable outcomes of climate change on the community's urban natural resources:

- Lower summer stream flows.
- Increased stream temperatures.
- Warmer terrestrial temperatures.
- Increased summer drought and risk of wildfire.
- Increased number and scale of problems caused by invasive species.

The projected changes in temperatures, rainfall patterns, stream flow and wildfire incidence will likely result in shifts in hydrology and in habitat types. As the region gets hotter and drier in summer, native plants and animals that are well adapted to current conditions may become less competitive than other species. Some plants and animals will likely disappear altogether and others will relocate.

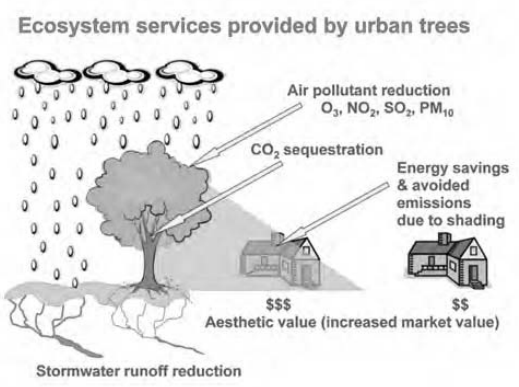
To increase the adaptability of Corvallis's natural resource systems, management approaches must consider the variety of natural resources—soil, trees, wildlife, and water—and manage them together across the urban landscape. Similarly, natural resource planning must be flexible, holistic, and considerate of the dynamic biological systems and potential impacts of climate change.

Objectives and Actions for Urban Natural Areas

Because natural resources are interdependent, many of the adaptation actions in this section—increased shading, decreased flooding, and improved wildlife habitat—can achieve multiple goals. For example, in areas where soils are protected from compaction, trees that provide shade grow healthier and are more resilient, and stormwater can better infiltrate the soil, which reduces flooding. When streamside flood zones are protected from development, buildings are less likely to flood, and stream banks can support shade trees that cool the stream and provide maximum wildlife habitat value.

Public lands within the Urban Growth Boundary (UGB) of Corvallis contain a diverse population of about 440,000 trees that include over 300 varieties and have an estimated tree cover of 31%. Urban trees provide a variety of "ecosystem services" or direct environmental benefits for people that can be quantified in both physical and economic terms. The annual benefits include:

- *energy savings and avoided air pollutant emissions due to shading of buildings*
- carbon sequestration *(storage)*
- *absorption of air pollutants*
- *reduction in stormwater runoff and required infrastructure*
- *increases in private real estate market values*



In 2009, the US Environmental Protection Agency estimated the annual benefit of Corvallis's urban forest to be $4,000,000, corresponding to an average of $9 per tree and $75 per capita. In terms of fixed asset values, the total carbon dioxide stored was valued at $1.45 million and the total replacement value of the trees was estimated at $450 million. Enumerating these benefits can raise citizen awareness of the value of public tree resources, as well as provide a basis for management to maximize benefits while controlling costs.[33]

OBJECTIVE 16: To cool buildings, pavement, and waterways, by 2030 expand Corvallis's urban forest canopy to cover at least 40 percent of publicly owned land and 100 percent of the total length of streams in the city that are tributaries to the Willamette and Marys Rivers.

Plant diverse species, including those native to the Willamette Valley, to increase the percentage of survivors under changing conditions. Locate plantings to maximize opportunities for co-benefits (e.g., cooling/shading homes, businesses, streams and riparian areas).

Mature trees can help reduce flooding, improve air quality, and cool streams and the urban heat island. *Tree shade reduces energy needed to heat and cool buildings and, in full summer sun, may*

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[33] *Assessment of Ecosystem Services Provided by Urban Trees: Public Lands Within the Urban Growth Boundary of Corvallis, Oregon*, US Environmental Protection Agency, 2009.

reduce the temperature of hard surfaces as much as 35˚ F. The greatest benefits will come from shading roadways, buildings, and streams. Trees can take 10 to 20 years before they provide a significant amount of shade, but tree planting is an inexpensive investment in the future livability of our community that can be done by almost anyone.

This Objective does not include a percentage for shading of the Willamette and Marys Rivers at this time because, as part of the Total Maximum Daily Load (TMDL) *project, the City has contracted with the Marys River Watershed Council (MRWC) to evaluate opportunities for tree planting within the Marys River watershed. The MRWC will conduct a shade-potential assessment on areas that have the highest potential for shade gain in the watershed and that will meet the Oregon Department of Environmental Quality's requirements in order for the City to receive temperature offset credits.*

Actions to be completed by the end of 2016

- 16.1. Require use of native species in all public projects.
- 16.2. Seek additional financial and volunteer resources to support implementation of the City's *Urban Forestry Management Plan*.
    - 16.2a) Re-examine the Urban Forestry plan to ensure that it places appropriate emphasis on reducing susceptibility to the likely increase in wildfires.

Actions to be completed by the end of 2020

- 16.3. Update the City's inventory of urban tree species and urban forest canopy cover.
- 16.4. Expand public and private programs to encourage planting, preserving and maintaining of trees and shrubs and to control invasive species.

American Forests' web site offers information about urban tree planting programs, including educational activities for youth. Visit the site's information about CITYgreen is a software tool that helps people understand the value of trees to the local environment. Planners and natural resources professionals use the program to test landscape ordinances, evaluate site plans, and model development scenarios that capture the benefits of trees. http://www.americanforests.org/

OBJECTIVE 17: By 2030, recognize trees, shrubs, vegetation and natural landscapes as capital assets of the City's infrastructure. Assign the physical and economic value of services provided by natural ecosystems to guide and inform land use planning, development decisions, and management of the City's watershed.

Actions to be completed by the end of 2016

- 17.1. Ensure that the City's watershed forest is managed to increase carbon stores over time, consistent with ecosystem values.

Actions to be completed by the end of 2020

- 17.2. Support State of Oregon efforts to develop standardized tools and processes for accounting and approving ecosystem credits and payments.
- 17.3. Assess whether and how ecosystem market approaches can enable the City of Corvallis to more efficiently and effectively protect and restore ecosystems.

- 17.4. Seek appropriate code amendments and make policy-level land use and development decisions that fully consider the services that ecosystems provide at an ecologically appropriate scale.
- 17.5. Create incentives to encourage residents and businesses to protect and enhance ecologically significant lands.

In July 2009, Oregon Governor Ted Kulongoski signed Senate Bill 513, which directs state agencies to consider how ecosystem services markets can complement the existing natural resource management tools used by the state. The bill defines an ecosystem services market as "a system in which providers of ecosystem services can access financing to protect, restore and maintain ecological values, including the full spectrum of regulatory, quasi-regulatory and voluntary markets." The law maintains that ecosystem services markets can save money, lead to more efficient, innovative and effective restoration actions than purely regulatory approaches, and facilitate pooling of public and private resources for conservation and restoration.

OBJECTIVE 18: Increase the acreage of protected natural habitat within the Corvallis Urban Growth Boundary (UGB) by 25 percent by 2030.

Acquiring, restoring and protecting significant natural areas will promote functional watersheds and forest ecosystems, sequester carbon, reduce the urban heat island effect, improve air and water quality (e.g., stormwater management, flood abatement, stream shading), connect habitats and wildlife corridors, and contribute to regional health, biodiversity, and resiliency.

Actions to be completed by the end of 2016

- 18.1. Recruit community volunteers to increase the capacity of City staff and local land use organizations to seek and draft grants for natural resource acquisition and restoration projects.
- 18.2. Identify and establish a range of diverse, stable, long-term funding sources for the acquisition, restoration and preservation of prime natural areas. For example:
    - 18.2a) Traditional funding sources, such as federal, state, and private foundation grants, corporate sponsorships and donations, may be available in limited fashion.
    - 18.2b) Creative funding methods such as land swaps, purchase of conservation easements, or other green investment funding methods.
    - 18.2c) Local grants and business sponsorships could fund unique or specific projects.

Actions to be completed by the end of 2020

- 18.3. Update and maintain natural features inventories so that the most climate-sensitive or significant natural resources can be tracked: e.g., stormwater resources, riparian buffers, opportunities for food production, solar resources, soil classifications, publicly-owned land.

OBJECTIVE 19: By 2030, reduce water flow (quantity) through the Corvallis municipal water systems (i.e., water and wastewater treatment plants, stormwater piping system) by 20 percent as compared to 2008[34] annual levels.

Actions to be completed by the end of 2016

- 19.1. Evaluate residential and institutional usage patterns of the three municipal water systems and current water use reduction programs. Recommend new programs that include recognition and economic incentives for reduced usage.

Actions to be completed by the end of 2020

- 19.2. Install water-efficient technologies that reduce annual flow through municipal tapwater, wastewater, and stormwater pipes.
    - 19.2a) Promote and incentivize water-efficiency technologies to property owners and, during permitting, require such technologies on all water-related systems.
    - 19.2b) Promote state-sanctioned water-efficiency wastewater technologies that reduce municipal wastewater flow for all existing buildings and, for all relevant building permits, require technologies that result in reductions (e.g., composting toilets, greywater re-use, on-site biological wastewater treatment systems).
- 19.3. Develop alternative water sources, such as rainwater and greywater, to reduce current flow levels in the municipal piping systems.

OBJECTIVE 20: Manage stormwater to reduce flooding, recharge groundwater, and improve water quality (ongoing).

Climate change is expected to increase downpours, and cause more intense winter storm events. To reduce flooding, stormwater must be slowed and allowed to infiltrate the soil. This type of stormwater management includes the use of tools such as bioswales, pervious pavement*, and* rain gardens*.*

Actions to be completed by the end of 2016

- 20.1. Promote *Low Impact Development (LID)* techniques for all properties.
    - 20.1a) When issuing building permits, require use of LID techniques (e.g., minimizing pavement/building footprint, rain gardens, infiltration trenches, permeable pavers, rainwater harvesting systems, green roofs, vertical gardens, drought-tolerant/layered vegetation, and "permaculture" design techniques).
    - 20.1b) Identify incentives to encourage property owners to retrofit/redesign existing structures and landscapes.

Actions to be completed by the end of 2020

- 20.2. Reduce or eliminate piped stormwater from draining directly into streams.
    - 20.2a) Evaluate the number and impact of direct storm drain outfalls on local waterways.
    - 20.2b) Open and set back piped stormwater outfalls that drain directly into streams.
    - 20.2c) Construct velocity-reducing wetlands and/or buffers between selected piped stormwater outfalls and stream channels.

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[34] Baseline from the *Community Sustainability Action Plan* developed in 2008 by the Corvallis Sustainability Coalition.

Appendix A: Climate Change in the Northwest

Ongoing research on the regional implications of global climate change largely confirms observations, projections and analyses made over the last decade while providing more information about how climate impacts are likely to vary from place to place within the region.

Climate

Updated research, including improved *climate models*, has refined descriptions of climate change. During 1895-2011, the Northwest warmed 1.3°F while precipitation fluctuated with no consistent trend. Over the period from 1970-99 to 2041-70, new models project NW warming of 2.0°F to 8.5°F, with the lower end possible only if greenhouse gas emissions are significantly reduced (RCP4.5 scenario; Fig 1). Annual average precipitation is projected to change by –5% to +14% for 2041-70. For every season, some models project decreases and some project increases; most models project lower summer rainfall by as much as 34%.

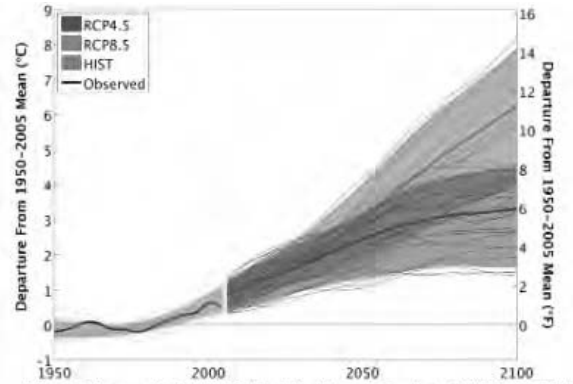

Fig. 1 Observed (1950-2011, black) and simulated (1950-2100) regional mean temperature for selected global models for the low-growth RCP4.5 and high-growth RCP8.5 scenarios.

Water

Changes in precipitation and air temperature have already affected hydrology and water resources in the Northwest. In most watersheds (except those with little snow), as snow accumulation diminishes, spring peak flows shift earlier, winter flow increases, and late-summer flow decreases. Dry years are becoming drier everywhere (Fig. 2). Some basins are likely to be buffered by groundwater.

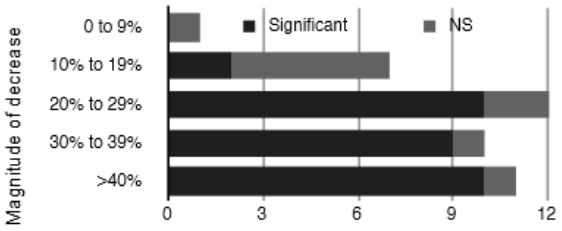

Fig. 2 Number of NW stream gauges with decreasing trends in 25th percentile annual flow that do (purple) and do not (blue) pass a significance test (α <0.10) over the 1948-2006 period. None have increased.

Irrigated agriculture is the largest consumptive water user in the Columbia River Basin and poses the greatest extractive demands on reservoir systems. Warmer, drier summers and longer growing seasons may increase those demands. Competing reservoir water demands could create summer water shortages and reduce the proportion of irrigable cropland and/or reduce the production and value of agricultural goods.

Hydropower production, which provides two thirds of the region's electricity, will also be affected by snowmelt-driven shifts in streamflow. By the 2040s, summer production is projected to decrease by about 15% and winter production to increase by about 4% compared with the period from 1917-2006. Further reductions in hydropower may also result from climate change adaptation; for example, flood control and instream flow augmentation for fish.

Changes in flood risk depend on the type of basin, with mixed rain-snow basins in Washington and Oregon already seeing

increases in flood risk. Floodplain development has increased *vulnerability* in many areas. Continued warming of rivers, lakes, and wetlands will affect the health of aquatic species and the extent of suitable habitat for many species, especially salmonids and other species already near their upper thermal tolerance.

Water-dependent recreational activities may be affected by dry conditions, reduced snowpack, lower summer flows, impaired water quality, and reduced reservoir storage. Difficulties for native fish including Pacific salmon could hamper sport fishing, while ski resorts near the freezing elevation will encounter less snow and more rain.

Coasts

Climate driven changes will likely be profound for Northwest coasts and associated ecosystems. Sea levels are projected to rise 4-56" by 2100 relative to 2000, with some local variations. Coastal marshes that cannot move upslope will shrink, affecting shorebirds and other species. Increased wave heights in recent decades have been a significant factor in the observed increased frequency of coastal flooding. About 2800 miles of roads in WA and OR are in the 100-year floodplain; some highways may face increased inundation with 2 feet of sea level rise.

In Northwest marine waters, elevated levels of absorbed CO2 combine with seasonal coastal upwelling and nutrient runoff to produce some of the world's most acidified conditions, hindering some marine organisms' ability to build shells; some sea grasses may benefit. Warm years already bring non-native southern species. Higher sea surface temperature may boost harmful algal blooms. Economic effects, both positive and negative, will stem from changes in productivity and distribution of commercially valuable marine species, such as shellfish.

Forests and other vegetation

About half the land area in the Northwest is forested. Climate directly affects tree growth in forests through temperature and moisture controls, and indirectly through its influence on disturbances—wildfires, insects, and diseases. The spatial distribution of suitable climate for many important NW tree species and vegetation types may change considerably by the end of the 21st century, and some vegetation types, such as subalpine forests, will become extremely limited. Affected habitats will in turn affect the species that depend on them, notably wolverines and pika at higher elevations, while some species like the northern flicker and hairy woodpecker may thrive with more frequent fires.

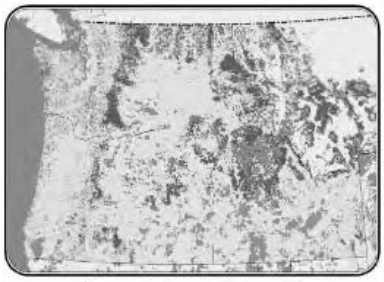

Fig. 3.

Large areas have been affected by disturbances in recent years (Fig. 3), and climate change is probably one major factor. One study estimated area burned will rise by roughly 900 sq mi by the 2040s, or a factor of 2.5 from the 1980-2006 average. Climate is a major driver of insect outbreaks that affect millions of forest acres. Insect life stage development and mortality rates are influenced by temperature, and drought can cause host trees to be more vulnerable to insects. Recent mountain pine beetle and other insect outbreaks were facilitated by higher temper-atures and drought stress, and the frequency of such

outbreaks is projected to increase, particularly in high-elevation forests.

Federal and state policies governing management and harvest may impact the economy as much as any effect attributable to climate change. Increased productivity in a milder climate with higher CO2 may be offset by insect and disease outbreaks (e.g. Swiss needle cast affecting the commercially important Douglas-fir), and wildfires.

Agriculture

The Northwest's diverse crops depend on adequate water supplies and specific temperature ranges, which are projected to change during the 21st century. Warmer winters and longer growing seasons could increase growth for some crops while adversely affecting other crops dependent on chilling periods. Warmer, drier summers could result in yield reductions due to heat and drought stress. More rainfall in the winter could mean wetter soils in the spring, which could benefit some crops while hampering planting of others. These climate changes could also result in changes in pressures from pests, weeds, diseases, and invasive species.

commodity	value ($b)	pathways
milk, dairy, cattle	6.0	heat stress, forage quality/availability
vegetables, hay	3.8	CO_2 fertilization, Irr.
fruits, nuts, berries	2.6	CO_2, Irr., heat, precip, chilling, pests
grains, oilseed	2.1	CO_2, Irr., heat, precip

Northwest agricultural commodites with 2007 market values and potential pathways for impacts of climate change on each sector. Irr=irrigation water availability.

Projected yield losses due to warming and drought are expected to be offset to varying degrees by CO2 fertilization for many crops. In a study with one climate scenario, winter wheat yields were projected to increase 13%-25% while spring wheat yields were projected to change by -7% to +2% by the 2040s across several locations in Washington, relative to 1975-2005. Yields of irrigated apples are projected to increase by 9%. Availability of water for irrigation is crucial and will depend on hydrological, structural, and policy (seniority of water rights) factors.

Warming may reduce productivity and nutritional value of forage on grazing lands. Alfalfa production may increase as long as water is available. Higher temperatures can affect animal health, and can reduce milk production and beef cattle growth.

Human Health

Effects of climate change on human health will depend on specific attributes of climate change and on exposure to climate-related risks. While vulnerability remains relatively low in the Northwest, adverse impacts of climate change outweigh any positive ones. Concerns include increased morbidity and mortality from heat-related illness, air pollution and allergenic disease, and emergence of infectious diseases. A changing climate is also expected to impact mental health.

Heat-related deaths in the US have increased over the past few decades. In Oregon, analysis of hospitalization and climate data showed that each 10°F increase in daily maximum temperature was associated with a nearly 3-fold increase in the incidence of heat-related illness. Wildfires, especially east of the Cascades, lead to days or weeks of poor air quality and respiratory disease. In Puget Sound, rising water temperatures promote longer harmful algal blooms which can cause paralytic shellfish and domoic acid poisoning in humans who consume infected shellfish.

Tribal communities

Tribes have always been intimately connected to the land and natural resources. In ceding their lands and resources to the US, tribes were guaranteed the rights to continue to hunt, fish, and gather in all their usual and accustomed places both on and off reservation lands. By altering the distribution and timing of traditional resources, climate change could affect these treaty-protected rights. Treaty-protected fish and shellfish populations may become less accessible to tribes. Changes in salmon abundance and tree species distribution, and risks to infra-structure, can affect the cultural, medicinal, economic, and community health of tribes.

Tribes are tied to their homelands by law and culture, yet the impacts of climate change will not recognize geographic or political boundaries. Tribal vulnerability and adaptation strategies require explicit attention because of the unique social, legal, and regulatory context for tribes. Tribal climate change efforts in the region are strengthened by strong government-to-government relationships, informed by traditional knowledge, and are resulting in strategies to address climate impacts on tribal resources and traditional ways of life.

This is a summary of *Climate Change in the Northwest: Implications for our Landscapes, Waters, and Communities.* Dalton, M.M., P.W. Mote, and A.K. Snover, eds., Island Press, 270pp. and available from www.occri.net/reports. Citations for statements made herein, and complete author list, are available in the full report. Suggested citation for this document: Mote, P.W., J. Bethel, S.M. Capalbo, M.M. Dalton, S.E. Eigenbrode, P. Glick, L. Houston, J.S. Littell, K. Lynn, R.R. Raymondi, W.S. Reeder, and A.K. Snover, 2013: Climate Change in the Northwest, Brief Summary

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Appendix B: Climate Planning and the Corvallis Vision

The seven focus areas from the current Corvallis Vision Statement (***in bold italics***) offer many emissions reduction opportunities. Many actions are already underway, and others can be undertaken to help achieve the 2020 Vision and to lay a foundation for the update of the Vision and the Corvallis Comprehensive Plan in 2015.

Central City: "Corvallis in 2020 boasts a Central City that is the vibrant commercial, civic, cultural and historic heart of the county."

Corvallis's "Central City" or "Downtown" is home to beautiful historic buildings, modern urban structures, aesthetically pleasing landscapes, and the beautiful Willamette Riverwalk. Using low-impact development standards and green building techniques when developing or redeveloping property, constructing and renovating buildings; preserving historic resources; decreasing the use of fossil fuels for building energy; and managing buildings at the end of life (e.g., deconstruction vs. demolition) will help to meet greenhouse emissions reduction goals by reducing energy and water consumption.

Cultural Enrichment and Recreation: "Corvallis in 2020 enjoys a cultural life which is rich in the arts and recreational opportunities, and celebrates the diverse talents and cultures of our community."

The natural beauty, quality of life, and supportive community of Corvallis and Benton County encourage and nourish the arts and recreation. Corvallis provides cultural and recreational opportunities and outdoor education through parks and natural areas. Some of the city's most popular festivals and events—da Vinci Days, Fall Festival, concerts in Central Park and Starker Arts Park, winery tours, sporting events—take place outdoors. By attracting tourists and enabling residents to spend their recreation and entertainment dollars locally, these cultural experiences are economic drivers in the community. The Parks and Recreation Department 10-year Master Plan outlines the future needs of facilities, parks, trails and recreation programs in response to community growth, but the current draft plan ignores the risks posed to parks and natural areas from climate change. Adapting to and managing the risks of a changing climate will indirectly ensure that Corvallis retains its thriving cultural and recreational opportunities with all their social, educational, and participative value.

Economic Vitality: "Corvallis in 2020 is home to a vibrant economy that is anchored by key strategic industries and complemented by a wealth of diverse, environmentally friendly businesses."

Corvallis recognizes that its livability is a primary source of its economic vitality. Corvallis boasts a vibrant, healthy economy that draws its strength from four directions:

1) *Broad base of employment in a diverse number of fields, with a predominance of small, locally owned businesses.*
   Climate protection policies and programs that manage risks and invest in long-term greenhouse gas reduction strategies will strengthen the local economy by driving demand for locally provided products and services. Because most routine daily activities generate carbon emissions, nearly every activity must be examined to identify cleaner and more sustainable alternatives. This fundamental reassessment presents major economic

opportunities that innovative businesses and individuals in Corvallis have already begun to take advantage of. The community is home to developers, builders, architects, engineers and product manufacturers in the green building industry. Clean energy firms, such as *photovoltaic* installers, biodiesel producers, and energy efficiency consultants are proliferating. The City also is a leader in bicycling products and local, organic foods.

2) *Family wage jobs linked in large part to education, technology, health care, professional services and research.*
   Many of the technologies, products and services required for the shift to a low-carbon future can be provided by Corvallis companies, thereby maintaining and creating local jobs. Dollars currently spent on fossil fuels will no longer leave our economy and will stay here to pay for home insulation, lighting retrofits, solar panels, bicycles, engineering, design and construction.
3) *Active and convenient regional transportation system which makes it easy to walk, cycle or ride mass transit.*
   Land use policies that limit sprawl reduce driving distances and make it easier for residents to get around by bicycles and on foot instead of relying on cars. This reduces both fuel use and greenhouse gas emissions.
4) *Business and community collaboration to maintain and improve the city's air and water quality."*
   Climate action is an effort the entire community needs to support and act on, not just something that the local government adopts and implements. Creating an innovative framework for the region's transition to a more prosperous, sustainable and climate-stable future not only will improve the city's air and water quality, but will create jobs, improve health, and maintain the high quality of life for which Corvallis is known.

Education/Human Services: "Corvallis in 2020 offers high quality educational opportunities and a comprehensive network of health and human services available to all residents throughout their lifetime."

Many of the risks of climate change affect public health (spread of disease, exposure to extreme temperatures, etc.). For example, diseases are emerging that have not been prevalent in Oregon's temperate climate. Actions such as improving air quality, creating more walkable neighborhoods, and encouraging the purchase of local, organic foods will provide a "health dividend" to Corvallis residents that is potentially vast in both financial terms and contribution to quality of life.

Governing and Civic Involvement: "Corvallis in 2020 fosters citizen participation in all aspects of community decisions. Neighborhood organizations are vigorous and their meetings and ward meetings provide opportunities for formal and informal discussions of community issues."

The development of this Climate Action Plan has already brought together a broad coalition of community organizations and individuals. The broad-scale coordination and planning required to achieve Corvallis's carbon reduction goal will demand that governments, businesses, civic organizations and residents collaborate extensively and take the lead in their own activities. As the community works toward that goal, it can also improve social equity by ensuring that populations most vulnerable to climate change are included in the implementation of Climate Action Plan items in a meaningful way and are given priority for green jobs, healthy local food, energy efficient homes and affordable, efficient transportation.

Protecting Our Environment: "Corvallis in 2020 has successfully integrated its economic and population growth with the preservation of its scenic natural environment, open spaces, clean air and water, wildlife habitat areas, and recreational opportunities."

The Corvallis Vision Statement anticipates a 2020 population of 57,000 to 63,000. However, more recent studies suggest that the Pacific Northwest may well experience population growth significantly above current expectations as the impacts of climate change become more profound. Scientists expect "climate refugees" to have a major effect on population shifts in the 21st century as large numbers of people move from hotter, drier regions to cooler, wetter ones. Corvallis and other cities in the Pacific Northwest will be destinations for these "refugees."

Corvallis currently has more than 1,730 acres of City parks and natural areas, but environmental degradation has rendered these natural systems less resilient than they once were. More than 150 years of urban development has diminished the capacity of our wetlands, floodplains and forests to absorb and accommodate precipitation, preparing us poorly for the expected increase in the frequency and intensity of severe weather events that climate change will bring to Oregon. Air and water quality, habitat, and biodiversity have been severely strained as trees, vegetation, and streams have been replaced by pavement and culverts. Weakened natural systems absorb less carbon directly and indirectly result in still more carbon emissions through the urban heat island effect, which raises temperatures in the city.

As Corvallis grows, it will push beyond its current boundaries and absorb other natural areas. Whether within or outside City boundaries, natural areas may suffer from overuse, become more difficult to maintain in their natural state, or disappear entirely. Since open space is often developed for shops, offices, industries, and homes, it is important for the City to protect natural areas in their undeveloped state to help quality of life keep pace with population growth.

Managing community greenhouse gas emissions from all sectors will help our watersheds, forests and ecosystems to remain healthy over time.

- Sustaining the values and functions of our tree canopy, rivers, streams, and wetlands can reduce emissions and sequester carbon while strengthening our ability to adapt to a changing climate.
- A healthy urban forest can reduce energy consumption in buildings as well as make walking and biking more attractive and safe.
- Shifts in consumption that lower personal and household carbon footprints can benefit regional and global ecosystems by reducing biodiversity loss and habitat degradation.

Where People Live: "Corvallis in 2020 offers balanced and diverse neighborhoods, incorporating mixed-use, that is accessible to residents without driving, which forms the building blocks that support a healthy social, economic, and civic life.

Beyond their economic benefits, actions that protect climate can also fundamentally improve community wellbeing. Carefully managing the connections between land use and transportation with the aim of reducing GHG emissions supports a "healthy social, economic, and civic life" by:

- Preserving local water and forests by reducing both pollution and the pressure to develop green spaces that provide valuable ecosystem services.
- Protecting and restoring the city and county's green infrastructure, adding to trails, parks and natural areas so that citizens have easy access to nature and recreational opportunities that are distributed equitably throughout the community.
- Increasing urban forest canopy, which improves the aesthetic appeal of neighborhoods, brings nature into urban areas, and improves air and water quality.
- Lowering energy and transportation bills for residents, business and government.
- Enabling residents to shop locally and produce their own food, which keeps dollars in our community.
- Reducing health-care costs of a healthy, active, productive community.

These are just a few examples of how a making Corvallis markedly less reliant on fossil fuels can simultaneously protect the climate and build a more prosperous, productive, and healthy community.

Appendix C: Efforts Already Underway in Corvallis

The City of Corvallis has taken many actions to reduce greenhouse emissions and staff investigate climate action opportunities on an ongoing basis. Detailed information about these projects can be found in the sustainability section of the City website and the annual sustainability reports, available at http://www.corvallisoregon.gov/index.aspx?page=211.

Buildings and Energy

Numerous organizations are working to increase energy efficiency and reduce GHG emissions in Corvallis. Corvallis residents and businesses can also take advantage of efficiency incentives from the City of Corvallis (low flow toilet rebates), the federal government and State of Oregon (tax credits), local utilities, and the Energy Trust of Oregon. Other efforts underway include:

- Corvallis Environmental Center programs: Communities Take Charge, Classrooms Take Charge, Clean Energy Works
- Direct Installation of energy saving or renewable energy producing products by local businesses
- Community Services Consortium Home Weatherization Program
- Oregon State University is implementing its Climate Action Plan to reduce GHG emissions from university buildings and operations
- Solar Installations: municipal (Blue Sky grants), household (tax credits, ETO incentives, third party financial plans), community (Seed for the Sol – local investment opportunity)
- Green Street Loans from Umpqua Bank
- Trade Ally contractors working with the Energy Trust of Oregon
- Georgetown University Energy Prize competition 2015-2016

Food and Agriculture

Many organizations and community groups are working to increase local food production and consumption, support organic gardening and farming, and develop regionally adapted seeds. For example, the Corvallis Sustainability Coalition's Food Action Team organizes an annual Local Eats Week and several edible front-yard garden tours. The Edible Corvallis Initiative also helps local schools source more locally grown fruit and vegetables for students. The City of Corvallis recently lowered the regulatory barriers to urban food production by reforming some of its zoning code. The list of existing efforts is too long to comprehensively describe, but here is a partial list:

- OSU Extension Service provides Master Gardener education, organizes educational gardening events, provides resources for land management of small acreages, and supports local, regional and farm-direct marketing among other efforts.
- Benton County Health Department is partnering with emergency food providers and other community groups to strategically plan for a South Corvallis Food Center.
- Corvallis Sustainability Coalition Food Action Team organizes an annual Local Eats Week and several edible front-yard garden tours, and annually publishes the Corvallis Garden Resource Guide.

- Farm-to-School/Edible Corvallis Initiative introduced tasting tables to Corvallis elementary schools where students get a taste of locally grown fruits and vegetables.
- Farmers' Markets
- Local Food Initiatives at Grocery Stores
- Food Pantries, Meal Sites, and SNAP (Food Stamps)
- Gleaners Groups
- Granges
- Slow Food Corvallis
- Small Farms Program
- Southern Willamette Valley Bean & Grain Project is rebuilding the local food system by stimulating the cultivation and local marketing of organically grown staple crops like beans and grains to provide a foundation for year-round food resources in the Willamette Valley.
- Women, Infants and Children (WIC) Office and Clinic

Land Use and Transportation

A number of government agencies, business, and non-profit organizations are working to reduce the community's dependency on fossil fuels for transportation. For years Corvallis has developed and implemented land use regulations, such as the state required Urban Growth Boundary, which facilitate compact growth and reduce transportation demand. The community has nationally recognized mass transit, and bicycle infrastructure systems that decrease dependence on single-occupant vehicles. City staff works with national and local alternate modes advocates to develop more non-vehicle transportation infrastructure:

- League of American Bicyclists
- Oregon Department of Transportation's Bicycle and Pedestrian Program
- Cascades West RideShare
- Bicycle Transportation Alliance
- Corvallis Bicycle Collective
- Mid-Valley Bike Club

With broad community input, the Corvallis Sustainability Coalition's Land Use Action Team established four goals to support a sustainable, compact city: walkable, mixed-use, diverse neighborhoods; easy access to diverse natural areas; green building practices; and increased access to locally owned and produced foods and goods while protecting resource lands, quality of life, and the environment. The Land Use team worked with local community volunteers to complete a citywide inventory of neighborhood amenities, walkability, and bikability and created a series of maps to help identify current conditions and opportunities to improve non-auto access to common amenties. The team is currently working with partner organizations to conduct a review of local land use codes to identify changes necessary to achieve more walkable, mixed-use neighborhoods, functioning neighborhood centers, and a vibrant downtown.

Consumption and Solid Waste

The City of Corvallis participates in Benton County's Solid Waste Advisory Council (SWAC), a State-mandated board comprised of local officials and citizens who represent various areas throughout Benton County. The SWAC is an advisory committee for the Benton County Board of Commissioners on all solid waste issues for Benton County.

The Corvallis Sustainability Coalition's Waste Prevention Action Team also has set goals and accomplished much in the area of waste reduction. The Team works in partnership with Republic Services, Corvallis's provider of garbage collection and recycling services. The Waste Prevention Action Team has helped to implement the following programs:

- Curbside collection of compost in yard debris bins
- Recycling block captain program
- Reuse directory
- Repair Fairs
- Faith Community Education

Oregon State University Campus Recycling manages a comprehensive waste management system that focuses on reducing, reusing and recycling with disposal as a last resort. Campus Recycling is also actively engaged in outreach activities. Campus Recycling works with Republic Services to offer Master Recycler classes and has a variety of other programs and challenges, such as Waste Watchers volunteers, Repair Fairs, the RecycleMania Civil War, the Residence Hall Move-Out Donation Drive, and the Coffee Cup Coup Campaign.

Health and Social Services

Numerous organizations in Corvallis and Benton County are working to address health and social service needs. Following are some of those that have taken the lead in addressing social inequities that may be exacerbated by the effects of climate change:

- Benton County Health Department
- Benton Habitat for Humanity
- Cascades West Rideshare
- City of Corvallis Transportation Options Program
- Community Services Consortium
- Corvallis Environmental Center (Edible Corvallis Initiative and Energize Corvallis)
- Corvallis Sustainability Coalition
- Healthy Aging Coalition
- Housing First (formerly Corvallis Homeless Shelter Coalition)
- Linn-Benton Food Share
- Linn-Benton Health Equity Alliance
- Mid-Valley Health Care Advocates
- South Corvallis Food Bank
- Willamette Neighborhood Housing

Urban Natural Resources

The City of Corvallis collaborates with other public agencies to conserve and responsibly manage the natural resources within its purview, including the Benton Soil and Water Conservation District, OSU-Benton County Extension Service, US Forest Service, US Fish and Wildlife Service, Oregon Department of Fish and Wildlife. The City has completed a number of resource inventories and natural resource plans to preserve the quality of its natural resources:

- Natural Features Inventories throughout the Corvallis Urban Growth Boundary (2003)
- Corvallis Forest Stewardship Plan (2006)
- Urban Forestry Management Plan (2009)
- Understory Vegetation Baseline Monitoring in the City of Corvallis Rock Creek Watershed (2010)
- Corvallis Forest Natural Resources Inventory (2010)
- Parks and Recreation Master Plan (2013)

Non-profit organizations also work to conserve native species and habitats in the Corvallis area through restoration, research and education. These include:

- Greenbelt Land Trust
- Native Plant Society of Oregon
- Institute for Applied Ecology
- Marys River Watershed Council
- Marys Peak Group Sierra Club
- Audubon Society of Corvallis
- Neighborhood Naturalist
- Chintimini Wildlife Center

Appendix D: Corvallis Community Greenhouse Gas Inventory Methodology

In 2014, the City of Corvallis completed the 2012 Community Greenhouse Gas Inventory Report*, which provides a summary of key findings and details about each category of emissions sources and activities. The following description of the inventory methodology is on page 6 of the report, which is available* at *http://www.corvallisoregon.gov/modules/showdocument.aspx?documentid=8183*.

In order to quantify GHG emissions in a way that is useful to local government and the community, it is important to use a standardized approach. This inventory uses the approach and methods provided by the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (Protocol), released by ICLEI – Local Governments for Sustainability in October, 2012. The Protocol establishes reporting requirements for all community GHG emissions inventories, provides detailed accounting guidance for quantifying GHG emissions associated with a range of emission sources and community activities, and provides a number of optional reporting frameworks. This Protocol is the national standard for U.S. local governments to account for and report on greenhouse gas emissions associated with their communities. Use of the Protocol provides an accepted methodology to estimate and report on GHG emissions associated with the community. This allows for more informed decisions about how and where to pursue GHG emissions reduction opportunities.

This Protocol requires inclusion of five Basic Emissions Generating Activities in their GHG emissions inventories:

1. Use of electricity by the community
2. Use of fuel in residential and commercial stationary combustion equipment
3. On-road passenger and freight vehicle travel
4. Use of energy in potable water treatment and distribution and wastewater collection and treatment
5. Generation of solid waste by the community

In addition to these five Basic Emissions Generating Activities, this inventory also estimates the emissions associated with the manufacturing and production of food, goods, and services consumed by Corvallis households and local government. Consumption generates emissions all over the world from activities such as mining, manufacturing, and transportation.

Appendix E: State of Oregon Climate and Energy Policy

Oregon's Statewide Energy and Climate Change Policy framework provides solid support for many of the actions outlined in this climate Action plan. Oregon's policies cover the efficient use of energy for heating, cooling, and operation of appliances in buildings, the generation of electricity from renewable, non-fossil energy sources, improvement in the carbon-intensity of transportation fuels, and non-binding coordination of action towards these goals. The agencies and organizations that drive and implement these policies are mentioned below.

Greenhouse Gas Reduction Goals

Oregon's Energy Policy and Climate Change mitigation effort began in the 1970's in response to the oil import crisis. The resulting policies, designed to buffer Oregon against the volatile costs of imported oil and rising energy costs, have also kept Oregon's carbon emissions and per capita energy use low by national standards. These policies are the foundation of Oregon's carbon reduction successes and are augmented by greenhouse gas reduction goals, now codified in law as ORS 468A.205 and hosted by the Oregon Global Warming Commission (see the Commission's website at http://www.keeporegoncool.org/). Oregon's goals are to reduce greenhouse gases by ~10% below 1990 levels by 2020 and at least 75% below 1990 levels by 2050. The Commission hosts an integrated plan to reduce Oregon's carbon emissions and is required to provide regular "bully pulpit" updates to the legislature on the plan and progress towards Oregon's goals.[35] In short, the Commission has determined that "Cars and Coal" must be the focus of carbon reductions over the next decade.

Energy for Heating and Cooling of Buildings. Oregon's energy policies currently comprise a set of laws and rules that combine to ensure that: a) carbon emissions do not grow with electricity load growth, b) carbon emissions from heating with natural gas are minimized, and c) nation-leading mandatory energy efficiency standards are in place for most appliances and some building construction.

Funding models are robust for policies impacting Investor Owned Utility (IOU) and Consumer Owned electric utility (COU) carbon emissions. Because energy efficiency is defined as the least cost resource for both investor[36] and consumer owned utilities[37] this drives investment in energy efficiency. In IOU-electric service territories, SB 838 (2007) and a 2.25% bill charge under SB 1149 (1999) combine to ensure funding sufficient to replace the 85-100% of electricity load growth with

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[35] *Oregon Global Warming Commission Report to the Legislature*, 2013: http://www.keeporegoncool.org/sites/default/files/ogwc-standard-documents/OGWC_2013_Rpt_Leg.pdf.

[36] Investments in energy efficiency are very cost effective for ratepayers; the costs are largely borne by the homeowner, with only incentives being paid by all the ratepayers (to avoid paying the full cost of a new power plant.)

[37] The Pacific Northwest Electric Power Planning and Conservation Act of 1980 calls out a requirement that the first investments in the Bonneville Power Administration-led utility system be energy efficiency and wildlife conservation. BPA also provides significant transmission integration for the Pacific Northwest.

investments in cost effective energy efficiency[38]. Decoupling agreements with the IOU-natural gas companies promise funding of 100% of cost effective natural gas energy efficiency (but not of load growth). These mainstream electricity and natural gas programs are augmented by low-income programs and by Oregon Department of Energy (ODOE) electric efficiency programs for K-12 Public Schools (.5% of bill) and Industrial customers. Low carbon electricity is also enabled by SB 1149 funded programs (.5% of bill) that incent the installation of renewable energy on residences and businesses, by *net metering* programs (1999) that enable customers to "trade" renewable energy for fossil fuel energy at retail rates, and utility scale installations mandated by the Renewable Portfolio Standard (RPS) –also from SB 838 (2007). The RPS requires electric utilities to supply 25% of their total load from *new* renewable energy sources (above and beyond old hydro). The net effect of energy efficiency investments and the RPS is that all electricity load growth since the year 2000 should be met by non-carbon resources. Tax credits for both energy efficiency and renewable energy investments are also available on Oregon tax returns.

Capable organizations administer these laws, including the ODOE, the Oregon Public Utility Commission, the Energy Trust of Oregon, the Northwest Energy Efficiency Alliance, the Northwest Power Planning Council and the Bonneville Power Administration. Capable advocacy organizations engage to ensure these laws/policy intentions are consistently administered. These bodies include the Citizens' Utility Board of Oregon (enshrined since 1984 in the Oregon Constitution), the Northwest Energy Coalition (including the electric and natural gas utility partners), the Community Action Partnership of Oregon, and many others. Efforts to dismantle this framework are few, but are led by the libertarian Cascade Institute and American Legislative Exchange Council (ALEC).

Standards for Appliances and Buildings. Oregon's standards for energy efficiency of appliances have consistently risen along with those of California (to date). Currently, voluntary building codes are offered that match the nation leading codes of other states. Voluntary *Energy Performance Scores* that communicate the efficiency performance of residential buildings are under development and are also intended for use by appraisers in home/building financing. Building energy code creation has recently moved from the Oregon Department of Energy to the Department of Consumer and Business Services.

Energy for Transportation. The Oregon Clean Fuels Program, approved in HB 2186 by the 2009 Legislature, aims to reduce the *carbon intensity* of transportation fuel used in the state. The Clean Fuels Program also seeks to create economic development opportunities in Oregon, increase the state's energy security and reduce air pollution for healthy communities. DEQ is implementing the program in phases. In December 2012, the Environmental Quality Commission adopted the first phase of rules allowing *DEQ* to collect information about fuels currently being imported into the

[38] SB 1149 directs 2.25% of utility bills to energy efficiency projects and SB 838 requires utilities to project the maximum achievable energy efficiency that can be "built out" and to fully fund incentives for those projects. The effectiveness of the decoupling mechanism to invest in energy efficiency is reduced as the cost of natural gas is reduced. Because of this, natural gas energy efficiency programs are under stress at this time.

state to create a baseline for measuring future reductions. In February 2014, Governor Kitzhaber directed DEQ to draft rules for the next phase of the program, which will require a 10-percent reduction in the carbon content of Oregon's transportation fuels over a 10-year period. This reduction represents about 280 million metric tons of greenhouse gases reductions through 2025.

Eliminating Coal. SB 488-2014 (a clarification of an earlier bill) has affirmed that Oregon investor owned utilities may not import more electricity derived from coal. This means that no investor owned utility supplying Oregon customers may install coal fired generation to meet Oregon load and may not enter into new contracts to buy coal-fired electricity to serve Oregon customers. In addition, Oregon's least cost-least risk requirements for utility investments and rigorous analysis of the costs of implementing technology to scrub mercury and fines pollution from coal stacks has led to promises by Portland General Electric to shut down the last coal fired power plant operating in Oregon by 2020. The example set by this Oregon action is being replicated in the investment profiles of generation in other states.

Rewarding Utilities for Reducing Carbon. SB 844-2014 allows natural gas utilities to propose programs to the Oregon Public Utility Commission that reduce carbon emission and, simultaneously, provide benefits to ratepayers. Until programs are proposed and approved by the Commission, the assumption is that these benefits would comprised reduced costs for ratepayers. Legislators did not include electric utilities as eligible for SB 844, citing opposition by Industrial Customers of NW Utilities as their rationale for this decision.

Putting a Price on Carbon. Also known as a clean air tax, a carbon tax, a revenue neutral carbon tax, or a carbon cap and trade program, these options for putting a price on carbon to "allow the market to drive greenhouse gases out of our national economy" are under consideration in Oregon. SB 306 commissioned a study of various carbon pricing options and these are expected to be reviewed and considered during the 2015 legislative session. Portland General Electric's counsel asserts that a carbon tax polls poorly in Oregon at this time, which suggests that legislation to impose such a tax would be difficult to pass or that such a tax would be referred to the voters upon passage….and would fail.

Appendix F: Advisory Panel

Dorothy Fisher Atwood has over 25 years of environmental consulting experience. For the last 10 years she has focused on management systems implementation for private and public organizations, including for the City of Corvallis. Dorothy is the Management Systems program manager for Zero Waste Alliance (ZWA), a Portland-based non-profit organization. She develops implementation tools and procedures, training, and processes for sustainability and environmental management system (including ISO 14001) integration into core business systems. Dorothy is an instructor for the University of Oregon's Sustainability Leadership Workshop Series and has co-authored two booklets on management systems for the Axis Performance Sustainability Series.

Bill Bradbury is an Ex Officio Member of the Oregon Global Warming Commission and one of Oregon's two representatives on the Northwest Power and Conservation Council. He has long been involved in Oregon politics and environmental issues affecting the state. He has served as Oregon's Secretary of State and as a member of the Oregon Senate, where he was Majority Leader and Senate President. He directed the non-profit organization, For the Sake of the Salmon, during which he worked with Northwest Native American tribes; federal, state and local governments; and timber, agriculture and fishing interests. Bill served as chair of the Oregon Sustainability Board from 2005 to 2009 and was one of the early participants in Vice President Al Gore's Climate Change training sessions. He travels around the state to present locally adapted information on global warming.

Kyle Diesner is a policy analyst at the City of Portland Bureau of Planning and Sustainability (BPS). He works primarily on climate change planning, energy efficiency and renewable energy programs, but he also provides analytical support to other BPS programs, including recycling, composting and the Bureau's long range planning efforts. Kyle works with the Clean Energy team on efficiency and renewable energy programs and is also in charge of completing the annual inventory of carbon emissions for the City and Multnomah County. He is the Co-chair of the BPS Diversity Committee and dedicates a portion of his time to the Bureau's social equity initiatives. From 2006 to 2009 Kyle worked on the Sustainable City Government program, where he coordinated the Portland Clean Diesel Partnership. Kyle has a BS in environmental science from Humboldt State University.

Kelly Hoell is an associate at Good Company, a Eugene consulting firm that helps clients measure, manage and market their sustainability performance. Kelly works primarily with government and business clients to provide technical and market research and business supply chain development. She has led the sustainability and greenhouse gas assessments and reporting for municipalities, multi-national food processors and regional food retail companies. Kelly manages BASEline: Carbon Footprints (formerly Operation Climate Collaborative), a streamlined program designed to guide municipal governments through the process of measuring and reporting their greenhouse gas emissions. She is an Adjunct Instructor in Planning, Public Policy, and Management for the Oregon Leadership in Sustainability (OLIS) program at the University of Oregon. In 2012 Kelly developed and taught a workshop on sustainable purchasing for City of Corvallis employees.

L. Hunter Lovins is President of Natural Capitalism Solutions (NCS,) a Colorado non-profit that helps companies, communities and countries implement more sustainable practices profitably. Trained as a sociologist and lawyer (JD), Hunter has helped create several MBA schools and is

currently professor of sustainable business at Bard MBA and Denver University. She lectures to audiences around the globe and has written 15 books and hundreds of articles. *The Way Out: Kickstarting Capitalism to Save Our Economic Ass* (2012) succeeds her international best-selling book, *Natural Capitalism*, now used in hundreds of colleges. Her latest, *Creating a Lean and Green Business System* won the 2014 Shingo Prize for Excellence in Manufacturing Research. She has won dozens of awards, including induction into the Hall of Fame of the International Society of Sustainability Professionals in 2013. Time Magazine recognized her as a Millennium Hero for the Planet, and Newsweek called her a Green Business Icon.

Chris Maser is a scientist, consultant, writer and speaker who covers a wide range of sustainability issues, including sustainable forestry, sustainable community development, environmental economics, citizen involvement in land use decisions, resolving environmental conflicts, protecting endangered species and wildlife habitat, environmental education, and the consequences of violence. He has authored or coauthored more than 30 books and 250 articles and given more than 100 talks throughout the United States, Canada, Europe, and Asia. Chris lives in Corvallis.

Matt McRae is the Climate and Energy Analyst for the City of Eugene. In 2009-10, Matt managed the effort to create Eugene's first community Climate and Energy Action Plan. His work includes implementing Eugene's Internal Zero Waste plan, managing an Internal Operations Greenhouse Gas Inventory, managing Eugene's 20-minute neighborhoods assessment, and overseeing progress on the Natural Hazards Mitigation Plan. Matt has a B.S. in Environmental Studies from Utah State University and worked for the National Park Service for nine years before joining the City of Eugene in 2002. He is an Adjunct Instructor in Planning, Public Policy, and Management for the Oregon Leadership in Sustainability (OLIS) program at the University of Oregon.

Babe O'Sullivan is the Sustainability Liaison for the City of Eugene, supporting sustainability initiatives for the City organization and the broader community. Her work covers a wide range of topics including climate action planning, land use and transportation, energy efficiency, Triple Bottom Line decision-making, and solid waste and recycling. She also provides staff support for the Eugene Sustainability Commission. She co-leads the Research Workgroup of the West Coast Climate and Materials Management Forum and is the recipient of a "National Notable Achievement Award" from EPA Administrator Lisa Jackson for her work to reduce the climate impacts of materials and waste. Previously, Babe coordinated the Solid Waste and Recycling program for the City of Portland's Bureau of Planning and Sustainability. She holds an MBA from the University of California, Berkeley and an undergraduate degree in environmental policy from the University of California, Davis. Babe is an Adjunct Instructor in Planning, Public Policy, and Management for the Oregon Leadership in Sustainability (OLIS) program at the University of Oregon.

Ann Scheerer is Consultant-Academic Advisor for Oregon State University's Sustainability Double Degree Program and an Adjunct Instructor for OLIS. With over 20 years of work experience in business (Siemens Energy and Automation), local government public works (City of Kirkland, Washington) and non-profit organizations (Sustainable Seattle, Sustainable Communities ALL Over Puget Sound - SCALLOPS), Ann possesses a broad perspective of multiple sectors. She is currently finishing her interdisciplinary dissertation on the effectiveness of behavioral interventions in local climate action planning for her PhD in Urban Planning at the University of Colorado. She has a MPA

from the University of Washington, a Master of Strategic Leadership towards Sustainability from the Blekinge Institute in Sweden, a BS in Mechanical Engineering from the University of Michigan, and a BA from Kalamazoo College.

Megan Shuler is the Sustainability at Work program manager with the City of Portland, Bureau of Planning and Sustainability. Sustainability at Work is a free service for businesses looking to green their workplace. Megan has over nine years of experience working on sustainability-related programs. In the past three years alone, those programs have served over 3,000 Portland businesses in the areas of transportation, water, energy and waste.

Jane M. Silberstein is Associate Dean at Bainbridge Graduate Institute, which pioneered the Sustainable MBA. She began her career as a transportation planner in Santa Barbara, CA, where she joined a team developing what became an award-winning citywide bikeway system. She subsequently became an urban planner in Santa Barbara and then Santa Cruz CA, both of which were pioneers in sustainable community development. Following the Loma Prieta earthquake in Santa Cruz in 1989, Jane was assigned to a major redevelopment effort. At that time, she came across Paul Hawken's *Ecology of Commerce*, which served as a major inspiration and portal to the field of sustainable community development. She subsequently moved into the arena of higher education (Northland College, University of Wisconsin) as faculty and administrator with a focus on sustainable community development. Jane has written numerous books and articles on land use planning and sustainable community development.

Kevin Wilhelm is the CEO of Sustainable Business Consulting, a Seattle-based consulting firm focused on practical solutions that deliver profit improvement and brand value through the use of sustainable business practices. Kevin has more than 15 years of experience working with businesses ranging from Fortune 500 multinationals to renewable energy start-ups. His firm's clients include Nordstrom, REI, The North Face, Coinstar/Redbox, Drugstore.com and Brooks Sports. In addition to his consulting work, Kevin is the author of *Return on Sustainability: How Business Can Increase Profitability & Address Climate Change in an Uncertain Economy* and a professor for the Bainbridge Graduate Institute's Sustainable Business MBA Program.

Appendix G: Glossary

Adaptation: An adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustments in response to actual or expected climatic stimuli or their effects, which lessens harm or exploits beneficial opportunities. Various types of adaptation include anticipatory and reactive, private and public, and autonomous and planned.

Architecture 2030: A non-profit, non-partisan and independent organization established in response to the global-warming crisis by architect Edward Mazria in 2002. The mission is to rapidly transform the US and global Building Sector from the major contributor of greenhouse gas emissions to a central part of the solution to the global-warming crisis.

Bicycle Friendly Community. A community recognized by the League of American Bicyclists as one that is welcoming to cyclists because of its trails, bike lanes, share the road campaigns, organized rides, Bike to Work Day events, etc. The BFC designation recognizes communities that encourage people to bike for transportation and recreation through the five Es: engineering, education, encouragement, enforcement, and evaluation.

Biofuel: A fuel produced from dry organic matter or from combustible oils produced by plants. Examples include alcohol from fermented sugar, black liquor from the paper manufacturing process, wood, and soybean oil.

Biomass: When referring to fuel, biomass is a plant-derived fuel from clean and untreated wood such as brush, stumps, lumber ends and trimmings, wood pallets, bark, wood chips or pellets, shavings, sawdust and slash, agricultural crops, biogas, or liquid biofuels, but excludes materials derived in whole or part from construction and demolition debris.

Bioswale: A vegetated depression that can temporarily store stormwater, reduce flooding, cleaning water, and encourage infiltration.

Carbon dioxide (CO2): The major heat-trapping gas whose atmospheric concentration is being increased by human activities. It also serves as the yardstick for all other greenhouse gases. The major source of CO2 emissions is fuel combustion, but they also result from clearing forests and burning biomass. Atmospheric concentrations of CO2 have been increasing at a rate of about 0.5 percent a year, and are now more than 30 percent above pre-industrial levels.

Carbon footprinting. The act of evaluating the greenhouse gas emissions associated with the life cycle of a product. Products can be consumer goods as well as products or materials sold business-to-business.

Carbon intensity: The amount of carbon emitted for each unit of energy consumed.

Carbon pricing. A method for reducing global-warming emissions by charging emitters of carbon dioxide for the right to emit one tonne of CO_2 into the atmosphere. Carbon pricing usually takes the form of a carbon tax or a requirement to purchase permits (also called “allowances”) to emit. Because such permits are privately tradable and emissions are limited to the total number of available permits (the cap), this system is known as cap-and-trade.

Carbon sequestration: The uptake and storage of carbon. Trees and other plants, for example, absorb CO2, and then release the oxygen while storing the carbon.

Carbon sinks: The processes or ecological systems that take in and store more carbon than they release. This process is called carbon sequestration. Forests and oceans are large carbon sinks.

Citizen's Climate Lobby (CCL). An international grassroots environmental group that trains and supports volunteers to build relationships with members of Congress in order to influence climate policy. Operating since 2007, the goal of CCL is to build bipartisan support to put a price on carbon, specifically a revenue neutral carbon fee and dividend at the national level.

Climate: The average state of the atmosphere including typical weather patterns for a particular region and time period (usually 30 years). Climate is the average, long-term weather pattern for a particular region, while weather describes the short-term state of the atmosphere. Climate measures average precipitation, temperature, wind, and seasonal phenomena such as length of the growing season.

Climate change: A significant change from one climatic condition to another, often used in reference to climate changes caused by the increase in heat-trapping gases since the end of the 19th century.

Climate model: A quantitative way of representing the interactions of the atmosphere, oceans, land surface, and ice.

Climate refugees: People displaced from their homes or lands by significant changes in climate such as increased drought, sea level rise, or increased storm intensity.

Community Scale Renewable Energy: A renewable energy system, photovoltaic for example, installed at a large scale: for example, over the roof of a large commercial building. Often this will include multiple investors paying for a single, large installation that will benefit many homes or businesses.

Ecosystem: Any natural unit of living and non-living parts that interact to produce a stable system through cyclic exchange of materials.

Embodied (greenhouse gas) Emissions: Greenhouse gas emissions associated with the expenditure of energy involved in the creation of a product. This includes the energy to extract raw materials (lumber, iron, etc.), process, package, transport, install, and recycle or dispose of products.

Emissions: The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere.

Energy efficiency: Ratio of energy output of a conversion process or of a system to its energy input.

Energy Performance Score: A home energy rating system similar to the miles-per-gallon (MPG) rating for the auto industry that enables homebuyers to directly compare energy consumption

between homes while offering a natural market incentive to upgrade their homes as much as possible.

Energy Trust of Oregon (ETO): A nonprofit organization that helps certain utility customers in the Pacific Northwest improve energy efficiency and tap renewable sources. ETO administers public purpose funds that are collected from customers for new cost-effective conservation, new market transformation, and the above market costs of new renewable energy resources.

EPA: The United States Environmental Protection Agency.

Fossil fuel: A general term for combustible geologic deposits of carbon in reduced (organic) form. Fossil fuels are of biological origin and include coal, oil, natural gas, oil shales and tar sands. A major concern is that they emit CO2 when burned, significantly enhancing the greenhouse effect.

GHG: Abbreviation for greenhouse gas. See definition for Greenhouse Gas below.

Global Warming: An average increase in the temperature of the Earth's atmosphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities. See climate change, greenhouse effect.

Greenhouse Effect: The thermal effect that results from heat-trapping gases allowing incoming solar radiation to pass through the Earth's atmosphere, but preventing most of the outgoing infrared radiation from the surface and lower atmosphere from escaping into outer space.

Greenhouse Gas (GHG): A term used for gases that trap heat in the atmosphere. The principal greenhouse gases that enter the atmosphere as a result of human activity are carbon dioxide, methane, and nitrous oxide. Others include, but are not limited to, water vapor, chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), ozone (O3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).

Greywater: Under Oregon law, greywater means wastewater from showers, baths, bathroom and kitchen sinks, and laundry. If handled properly, greywater can safely be reused for flushing toilets and urinals as well as for irrigation. Reuse of greywater reduces the demand on other sources of water, such as potable water, surface water, and groundwater.

Intergovernmental Panel on Climate Change (IPCC). Established in 1988, the IPCC assesses information in the scientific and technical literature related to all significant components of the issue of climate change. Hundreds of the world's key experts on climate change and the environmental, social and economic sciences from some 60 nations have helped the IPCC prepare periodic assessments of the scientific underpinnings of global climate change and its consequences. The IPCC is looked to as the official advisory body to the world's governments on the state of the science of the climate change issue.

Impervious surface: Surfaces such as concrete, asphalt, and building roofs that don't allow water to penetrate. These surfaces collect and concentrate rainwater increasing the potential for water pollution and flooding.

Invasive species: An introduced species that invades natural habitats.

Kyoto Protocol. An international agreement linked to the United Nations Framework Convention on Climate Change. Parties commit to setting internationally binding emission reduction targets.

Land use: Human-determined arrangements, activities, and inputs undertaken in a certain land type, the social and economic purposes for which land is managed (e.g., grazing, timber extraction, and conservation).

Lifecycle (of goods): The complete life (of goods)—the mining or extraction of raw materials, the manufacturing processes, transportation, packaging, retail, the use of goods, and finally their disposal.

LEED: Leadership in Energy and Environmental Design, a program of the United States Green Building Council and a commonly used green building standard.

Low Impact Development (LID). A design approach that protects soil and increases the resiliency of stormwater systems by maintaining and enhancing natural water movement, both within a developing site and throughout urban areas. Some LID strategies include preventing unnecessary soil compaction, retaining rainwater on-site, and designing stormwater systems to put water back into the soil instead of into the storm drain.

Methane (CH4): A hydrocarbon that is a heat-trapping gas carrying a global warming potential recently estimated at 24.5. Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and oil, coal production and incomplete combustion of fossil fuels.

Metric ton (Mt): Common measurement for the quantity of greenhouse gas emissions. A metric ton is equal to 2205 lbs or 1.1 short tons.

Mitigation: An intervention to reduce the sources or enhance the sinks of greenhouse gases.

Megawatt (MW): A measure of electricity use. One MW is equal to 1000 Kilowatts.

Natural gas: A fossil fuel that occurs as underground deposits of gases consisting of 50 to 90 percent methane (CH4) and small amounts of heavier gaseous hydrocarbon compounds like propane (C3H8) and butane (C4H10).

Net metering: A special metering and billing agreement between utilities and their customers, which facilitates the connection of small, renewable energy-generating systems to the power grid. When a net metering customer's renewable energy system is producing more power than is being consumed, the electric meter runs backward generating credits. When a customer uses more power than is being produced, the meter runs forward. Customers are charged only for the "net" power

that they consume over a designated period or, if their renewable energy-generating systems make more electricity than is consumed, they may be credited or paid for the excess electricity contributed to the grid over that same period.

ODOT: Oregon Department of Transportation

Oregon DEQ: Oregon Department of Environmental Quality

Oregon DOE: Oregon Department of Energy

Pervious pavement: Pavement (asphalt or concrete) that is designed so that water can move through the pavement and infiltrate into the ground.

Photovoltaic (PV): A solar power technology that converts sunlight into electricity.

Price signal. Information conveyed to consumers and producers, via the price charged for a product or service, thus providing a signal to increase supply and/or decrease demand for the priced item. See definition for Carbon Pricing.

Rain Gardens: Stormwater management structures designed to slow runoff, clean water, and increase soil infiltration.

Renewable Energy: Energy sources that are, within a short time frame relative to the Earth's natural cycles and sustainable. They include non-carbon technologies such as solar energy, hydropower, and carbon-neutral technologies such as biomass.

Resilience: Amount of change a system can undergo without altering state.

Seeds for the Sol: A Corvallis-based non-profit organization devoted to removing the financial barrier to residential solar. In partnership with community members, Seeds for the Sol uses a funding model that mimics the natural cycles of planting, harvesting, and renewal to help more people put solar on their roofs.

Smart Grid: A modernized electrical grid that uses analogue or digital information and communications technology to gather and act on information, such as information about the behaviors of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity.

Source (greenhouse gas): Any process or activity that releases into the atmosphere a greenhouse gas, an aerosol or a precursor to a greenhouse gas.

Stormwater: Rain, snow, and other precipitation that falls onto buildings, streets, and the ground. Stormwater is managed within the stormwater system of downspouts, gutters, underground pipes, and streams.

350.org: An international environmental organization founded by author Bill McKibben with the goal of building a global grassroots movement to raise awareness about climate change, to confront climate change denial, and to cut emissions of carbon dioxide. 350.org takes its name from the

research of Goddard Institute for Space Studies scientist James E. Hansen, who posited in a 2007 paper that 350 parts-per-million (ppm) of CO_2 in the atmosphere is a safe upper limit to avoid a climate tipping point.

Total Maximum Daily Load (TMDL). A calculation of the maximum amount of a pollutant that a body of water can receive and still safely meet the water quality standards of the U.S. Clean Water Act.

Upcycling. The process of converting waste materials or useless products into new materials or products of better quality or for better environmental value.

Urban heat island: A condition that occurs when the urban area is warmed by dark pavement, roof shingles, and buildings.

Vehicle-miles traveled (VMT): A measurement to determine the amount of automobile traffic—can also be used to estimate greenhouse gas emissions.

Vulnerability: The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate variability and extremes.

Wastewater: Used water that contains dissolved or suspended waste materials.

Weather: Atmospheric condition at any given time or place measured in terms of wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather can change from hour to hour, day to day, and season to season. Climate is usually defined as the "average weather."

Appendix H: Appreciations

The Corvallis Climate Action Plan Task Force expresses our deep appreciation to all the individuals who contributed to this plan through their ideas and insights, research, technical expertise, writing, editorial assistance, community outreach, encouragement, food, and other vital elements. We are still receiving feedback, so are acknowledging contributions here in lieu of the Topic Specialists Appendix that we held space for in the previous draft.

Inspiration

Linda Geiser
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Technical Experts

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Land Use: Susan Morre (Corvallis Sustainability Coalition Land Use Action Team)
Solid Waste: Jeannette Hardison (Corvallis Sustainability Coalition Waste Action Team), Andrea Norris (OSU Recycling), Julie Jackson (Republic Services)
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City of Corvallis

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Public Works: Mary Steckel, Scott Dybvad

City of Corvallis

2012 Community Greenhouse Gas Inventory Report

Photo by Paul Bausch, 2013

> We envision that in 2020 Corvallis will be a highly livable city which employs local benchmarks to measure its progress in areas such as housing, economic vitality, educational quality, environmental quality, and overall quality of life.
>
> - The Corvallis 2020 Vision Statement

The City of Corvallis Sustainability Program completed this Community Greenhouse Gas Inventory with support from a grant provided by the Environmental Protection Agency's Climate Showcase Communities Program.

The grant was awarded for Energize Corvallis, a strategic collection of residential energy efficiency programs managed in partnership by the City of Corvallis, the Corvallis Environmental Center, OSU Benton County Extension, and The Resource Innovation Group.

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The City of Corvallis thanks all the individuals and organizations below who assisted with technical questions, data, and other information that was vital to completing the greenhouse gas inventory. A special thanks to Tom Ekstedt, an exceptional community volunteer, who provided insight, knowledge, and an investigative sense to the information-gathering phase of the inventory process.

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Photo credit: Corvallis Sunset by Paul Bausch, November 2013, www.flickr.com/photos/pb/10793954744/

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Summary of Key Findings

In order to provide information for the community's efforts to better understand its climate impact, the City of Corvallis conducted a Community Greenhouse Gas Inventory for Corvallis, Oregon for the 2012 calendar year. The city limits serve as the physical boundaries. The inventory was completed under the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, a methodology developed by ICLEI – Local Governments for Sustainability and released in October, 2012. Emissions sources included in the inventory cover the broad categories of stationary emissions, electricity, transportation, solid waste, and the emissions associated with household and government consumption of food, goods and services. This inventory should serve as a baseline for future inventories and to track the community's impact.

Total emissions

Total emissions in 2012 for the Corvallis community are estimated at 1,257,115 Metric Tons Carbon Dioxide Equivalent (MT CO_2e). The chart below summarizes the findings based on the five Basic Emissions Generating Activities plus Household and Government Consumption.

Corvallis Community Greenhouse Gas Emissions – 2012
1,257,115 Metric Tons Carbon Dioxide Equivalent (MT CO_2e)

Food and Goods
Estimated emissions: 507,270 MT CO2e

Electricity
Estimated emissions: 341,895 MT CO2e

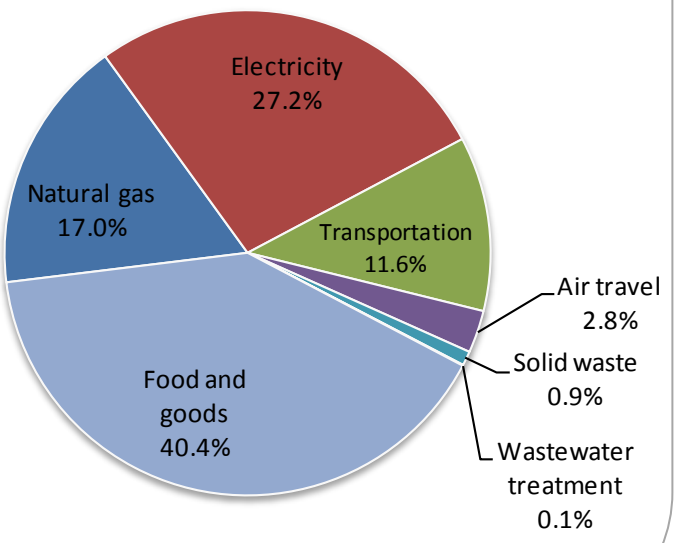
Natural Gas
Estimated emissions: 213,453 MT CO2e

Transportation
Estimated emissions: 146,273 MT CO2e

Air Travel
Estimated emissions: 35,603 MT CO2e

Solid Waste
Estimated emissions: 11,924 MT CO2e

Wastewater Treatment
Estimated emissions: 698 MT CO2e



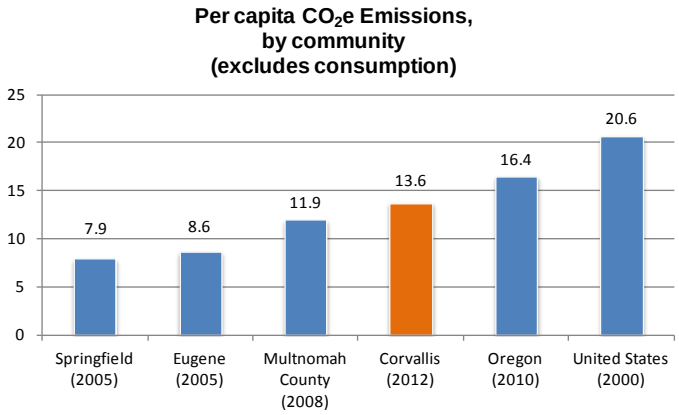
Comparison of emissions

It is useful to compare a community's emissions over time to determine whether emissions are increasing or decreasing and to uncover any changes in where emissions are generated. For this community inventory, only one year's data was analyzed, so comparisons over time are not available.

It can also be insightful to compare the greenhouse gas (GHG) emissions of one community to other communities. But for those comparisons to be effective they must compare similar measures. To ensure better results, greenhouse gas inventory comparisons should:

1. Include similar GHG emission generating activities and sources, such as whether emissions from consumption are included,
2. Compare communities with similar circumstances, such as whether a landfill falls within a community's boundaries, and
3. Use similar methodologies to calculate emissions.

These factors limit the number of possible comparisons. Additionally, few locations have completed greenhouse gas inventories of any kind and of those that have, even fewer compile data regularly. However, when those factors are met, communities of any size can compare results when per capita figures are used.



With those factors in mind, the chart on the right shows per capita GHG emissions, excluding consumption associated emissions, for several locations. It is important to note the different time periods covered and that some broad assumptions had to be made for this comparison (e.g. the inclusion of air travel or whether transportation models have the same assumptions around the types of travel included). For context, U.S. greenhouse gas emissions slowly increased until 2007 then declined to the point where 2012 emissions were roughly equal to 1994 levels.

This report can serve as a starting point for informed decisions to reduce the community's greenhouse gas emissions. An electronic version of this report, data gathered for the inventory, equations, emissions factors, and assumptions can be found on the City of Corvallis website at www.corvallisoregon.gov/communityGHGinventory.

Methodology

In order to quantify GHG emissions in a way that is useful to local government and the community, it is important to use a standardized approach. This inventory uses the approach and methods provided by the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions[1] (Protocol), released by ICLEI – Local Governments for Sustainability in October, 2012.

The Protocol establishes reporting requirements for all community GHG emissions inventories, provides detailed accounting guidance for quantifying GHG emissions associated with a range of emission sources and community activities, and provides a number of optional reporting frameworks.

This Protocol is the national standard for U.S. local governments to account for and report on greenhouse gas emissions associated with their communities. Use of the Protocol provides an accepted methodology to estimate and report on GHG emissions associated with the community. This allows for more informed decisions about how and where to pursue GHG emissions reduction opportunities.

This Protocol requires inclusion of five Basic Emissions Generating Activities in their GHG emissions inventories:

1. Use of electricity by the community
2. Use of fuel in residential and commercial stationary combustion equipment
3. On-road passenger and freight vehicle travel
4. Use of energy in potable water treatment and distribution and wastewater collection and treatment
5. Generation of solid waste by the community

In addition to these five Basic Emissions Generating Activities, this inventory also estimates the emissions associated with the manufacturing and production of food, goods, and services consumed by Corvallis households and local government. Consumption generates emissions all over the world from activities such as mining, manufacturing, and transportation.

[1] http://www.icleiusa.org/tools/ghg-protocol/community-protocol

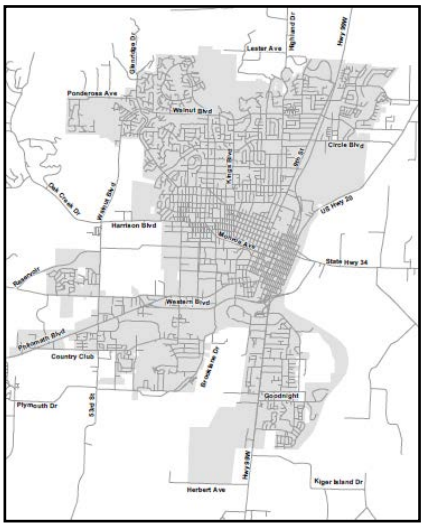
Community Emissions Inventory Results

This section provides technical details used in developing this greenhouse gas inventory. The intent is to provide information that advances consistent, comparable, and relevant quantifications of community GHG emissions. Greater detail is available in the appendix and on the City's website.

Community Profile

The first step in any greenhouse gas inventory is to determine its parameters – the timeframe, the physical boundaries, the emission sources to be included, and the methodology used to gather and translate data into emissions. Corvallis' city limits serve as the boundary for this inventory and calendar year 2012 is the timeframe for which emissions were calculated. Information on Corvallis' population and housing units comes from Portland State University and the U.S. Census Bureau.

Estimated 2012 Corvallis Population[2]	55,055
Estimated 2010 Corvallis Housing Units[3]	23,423



Corvallis city limits, 2012

Emissions Data and Sources

This section provides details about the various sources and activities that generate emissions. Data sources and emissions factors and calculations are described with some detail here and with greater detail in the Protocol and on the website.

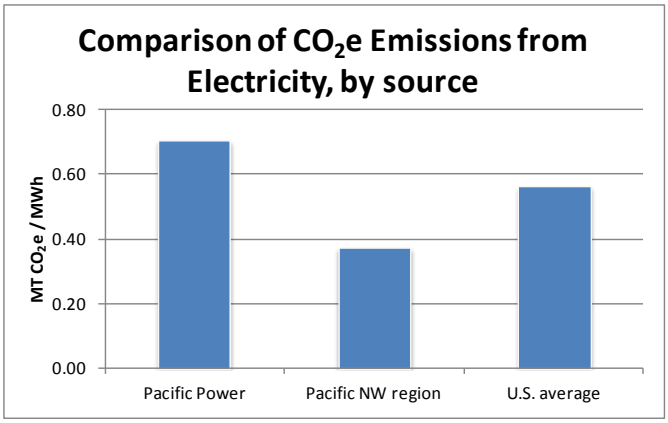
Emissions from Electricity Use

This category estimates emissions associated with the production of electricity used in the community. Estimating emissions from electricity use is fairly straightforward. Electricity in Corvallis is purchased from two utilities, Pacific Power and Consumers Power, Inc. Both utilities provided community usage data for the inventory year. A breakdown of electricity usage by residential, commercial, and industrial users was not available.

[2] Portland State University population estimate 2012 http://www.pdx.edu/prc/population-estimates-0
[3] U.S. Census data 2010 http://www.census.gov/2010census/popmap/ipmtext.php?fl=41:4115800

Emissions from Electricity Use						
341,265 MT CO_2e	**Usage data**		**Emissions factors**			**Method**
	Value	**Unit**	**Value**	**Unit**	**Source**	
Pacific Power	482,488	MWh*	0.7040	MT CO_2e/MWh	PacifiCorp	BE 2.1
Consumers Power Inc.	45,487		0.3842		eGRID	
Method and data source notes: Usage data for 2012 from Pacific Power and Consumers Power. Emissions factors for Pacific Power from PacifiCorp for 2012 and for Consumers Power from eGRID's NWPP WECC emissions factors for 2010[4]. *MWh = Megawatt hour = 1,000 Kilowatt hours (kWh)						

Overall, emissions related to electricity account for a little over 27% of the community's emissions. This high percentage may surprise some due to the Pacific Northwest's reputation for having a large portion of the region's electricity generated through hydropower. While this may be true for the region as a whole, the generation mix of some providers relies more heavily on fossil fuels. Pacific Power, which provided over 91% of the electricity used in the community in 2012, generates 67% of their electricity from coal and 13% from natural gas[5]. The chart at right shows a comparison of CO_2e emissions from electricity by source.



Electric Power Transmission and Distribution Losses

When electricity is transmitted through power lines, a certain amount is lost as heat. Of the community's electricity consumption, roughly 6.8% is lost during transmission and distribution.

Electric Power Transmission and Distribution Losses						
629 MT CO_2e	**Activity data**		**Emissions factors**			**Method**
	Value	**Unit**	**Value**	**Unit**	**Source**	
Community electricity use	527,976	MWh	6.84	Grid Gross Loss (%)	eGRID	BE 4.1
Method and data source notes: From EPA's Year 2010 eGRID 9th edition Grid Gross Loss (%) at http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html						

[4] EPA's eGRID Summary Tables http://www.epa.gov/cleanenergy/documents/egridzips/eGRID_9th_edition_V1-0_year_2010_Summary_Tables.pdf

[5] Oregon Department of Energy's "Where does Oregon's Electricity come from?" website http://www.oregon.gov/energy/pages/oregons_electric_power_mix.aspx

Emissions from Stationary Fuel Combustion

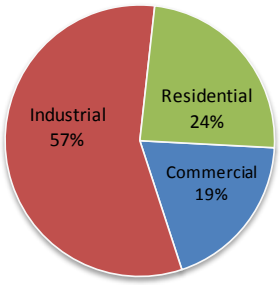
This broad category covers activities which directly combust fuels for the production of heat for space heating, process heating, and cooking. While there are multiple types of fuels used for these applications, in Corvallis, as in most communities, natural gas is by far the most widely used. NW Natural Gas is the sole supplier to the community, so usage data was relatively easy to obtain. Usage data for other fuel types, from biomass fuels such as wood to petroleum products like distillate fuel oils, are much more difficult to determine and were not included in this inventory.

Emissions from Stationary Fuel Combustion						
172,526 MT CO_2e	**Usage data**		**Emissions factors**			**Method**
	Value	**Unit**	**Value**	**Unit**	**Source**	
Natural gas	3,248,565	MMBtu*	.05302 CO2 5 x 10^{-6} CH_4 1x10^{-7} N_2O	MT/MMBtu	Protocol	BE 1.1
Method and data source notes: Therms provided by NW Natural Gas for usage in 2012 multiplied by Pipeline (US Weighted Average) emission factor found in the Community Wide Protocol Appendix C Table B.1 *MMBtu = one million British Thermal Units (BTU)						

Data for residential, commercial, and industrial uses was available from NW Natural Gas. Usage and emissions data by sector is shown here.

2012 Natural Gas Usage by Sector			
	Industrial	**Residential**	**Commercial**
Usage (MMBtu)	1,845,843	781,378	621,344
Emissions (MT CO_2e)	97,963	41,535	33,028

Percentage of Total Natural Gas Emissions, by sector



Upstream Emissions from Stationary Fuel Combustion

This category considers the energy used to extract, process and deliver fuels (in this case, natural gas) to the combustion point. These emissions refer only to the process of producing fuels, not the emissions associated with infrastructure, such as mines or refineries, or disposal of spent fuels.

Upstream Emissions from Stationary Fuel Combustion						
40,927 MT CO_2e	**Activity data**		**Emissions factors**			**Method**
	Value	**Unit**	**Value**	**Unit**	**Source**	
Natural Gas	3,248,565	MMBtu	445	Kg CO_2e / Thousand Cubic Meters	Protocol	BE 5.1
Method and data source notes: 2012 natural gas usage provided by NW Natural. Upstream emissions factors used in Protocol obtained from National Renewable Energy Laboratory (2007) and Oregon Department of Environmental Quality (2012).						

Passenger Vehicles

Passenger vehicle emissions consist of direct emissions from the combustion of petroleum-based fuels by internal combustion engine passenger cars and light duty trucks. Most inventory protocols seek to calculate emissions from trips that begin or end within the boundary. Those trips can be internal-internal (all travel is within the boundary), internal-external (travel begins within the boundary and ends outside the boundary), or external-internal (travel begins outside the boundary and ends within the boundary).

For this inventory, ICLEI's Protocol was not used to estimate emissions due to the lack of necessary data. Instead, Oregon's Department of Transportation (ODOT) recently prepared transportation demand modeling for the Corvallis Area Metropolitan Planning Organization (CAMPO) using their widely accepted GreenSTEP modeling tool. Outputs from that model were used to determine emissions for Corvallis.

Passenger Vehicles					
116,622 MT CO_2e	**Activity data**				**Method**
	Value	**Unit**	**Value**	**Unit**	
All Household Vehicles in CAMPO	843,268	VMT*	81.7%	MPO population in Corvallis city limits	ODOT's GreenSTEP
Method and data source notes: Emissions were estimated using ODOT's GreenSTEP Model, which was evaluated at the county and Metro Area (or CAMPO) levels using 2010 data. Corvallis-only data was then disaggregated from the Metro Area data and includes only internal-internal, internal-external, and external-internal travel as ICLEI does not recommend including external-external (or pass-through) travel. *VMT = Vehicle Miles Traveled					

Freight and Service Trucks

This category includes direct emissions from freight and service on-road transportation, including medium and heavy-duty trucks. Outputs from ODOT's GreenSTEP modeling tool were again used to determine emissions for the Corvallis community. Only internal-internal, internal-external, and external-internal trips were included.

Freight and Service Trucks					
28,513 MT CO_2e	**Activity data**				**Method**
	Value	**Unit**	**Value**	**Unit**	
All Commercial Service Trucks in CAMPO	109,625	VMT	91.4%	MPO employment in Corvallis city limits	ODOT's GreenSTEP
All Heavy Duty Trucks in CAMPO	33,725	VMT	57%	CAMPO highway miles within Corvallis city limits	
Method and data source notes: Emissions were estimated using ODOT's GreenSTEP Model, which was evaluated at the county and Metro Area (or CAMPO) levels using 2010 data. Corvallis-only data was then disaggregated from the Metro Area data and includes only internal-internal, internal-external, and external-internal travel as ICLEI does not recommend including external-external (or pass-through) travel.					

Transit

This category includes direct emissions from the combustion of petroleum-based fuel by internal combustion engine transit vehicles in the Corvallis Transit System. Actual fuel usage data was used to calculate related emissions. Emissions from fuel use for Benton County's special and regional transportation systems, such as Dial-A-Bus or the Linn-Benton Loop, were not estimated.

Transit			
1,138 MT CO_2e	**Activity data**		**Method**
	Value	**Unit**	
Transit	88,982	gallons biodiesel (B5)	EDF / NAFA Fleet Emissions Calculator
Method and data source notes: 2012 City of Corvallis transit fuel usage data used in Environmental Defense Fund (EDF) / NAFA Fleet Management Association Fleet Greenhouse Gas Emissions Calculator.			

Air Travel

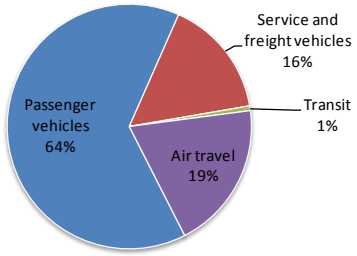
This category is a component of the consumption-based emissions accounting, which estimate the global emissions associated with household purchase and use of products and services. Estimates were produced using the CoolClimate Calculator and multiplying by the number of households in the community. The Calculator's results estimated the average Corvallis household contributes 1.52 MT CO_2e each year through air travel. This is roughly equivalent to one round-trip flight from Portland to New York City with one stopover per household per year.

Air Travel			
35,603 MT CO_2e	**Activity data**		**Method**
	Value	**Unit**	
Air Travel	1.52	MT CO_2e / household	CoolClimate Carbon Footprint Calculator by University of California, Berkeley
Method and data source notes: Emissions estimates obtained from the CoolClimate Carbon Footprint Calculator, then Air Travel emissions itemized separately. Household unit data from U.S. Census Bureau.			

Transportation Summary

Overall, transportation emissions, including air travel, account for over 14% of the community's GHG emissions. The chart on the right shows the various sources of transportation emissions and their contribution to the total. By far the biggest contributor is passenger vehicles. The second largest source of transportation emissions is from air travel, followed by service and freight vehicles. Transit contributes a very small amount to overall transportation emissions.

Emissions from Transportation



Wastewater

Wastewater treatment processes create emissions when microorganisms degrade the soluble organic material in wastewater under anaerobic conditions, creating methane (CH_4) and nitrous oxide (N_2O) and carbon dioxide (CO_2). During collection and treatment, wastewater may be unintentionally or deliberately managed under anaerobic conditions, potentially releasing some uncaptured or uncombusted CH_4 into the environment.

Wastewater **698 MT CO_2e**	**Activity data**			
	Value	**Unit**	**Source**	**Method**
CH_4 Emissions from Combustion of Anaerobic Digester Gas	0.93	MT CO_2e	Protocol	WW.1.b
N_2O Emissions from Combustion of Anaerobic Digester Gas	27			WW.2.b
Process N_2O Emissions from Treatment Plants with Nitrification or Denitrification	149			WW.7
Fugitive N_2O Emissions from Effluent Discharge	521			WW.12(alt)
Method and data source notes: Wastewater treatment data from City of Corvallis Wastewater Recovery Plant report to the Department of Environmental Quality. 61,100 ft^3 of digester gas produced per day with BTU content of 619 BTU / ft^3.				

Community-generated Waste Sent to Landfills

This category determines emissions that occur as a result of waste disposed of by a community's population. This method estimates emissions resulting from solid waste generated in Corvallis and deposited in 2012 at the Coffin Butte Landfill. Because of the lack of widely accepted and standardized data and guidance, the Protocol does not include methodologies to estimate emissions from composting.

Community-generated Waste Sent to Landfills **11,272 MT CO_2e**	**Activity data**		**Emissions factors**			**Method**
	Value	**Unit**	**Value**	**Unit**	**Source**	
Community Waste to Landfills	39,760	Wet short tons	0.06	MT CH_4 / wet short ton	Protocol	SW.4
			0.75	Landfill Gas collection efficiency		
			0.1	Oxidation rate		
Method and data source notes: Corvallis community waste tonnage reported in Republic Services 2012 Annual Report.						

Process Emissions Associated with Landfilling

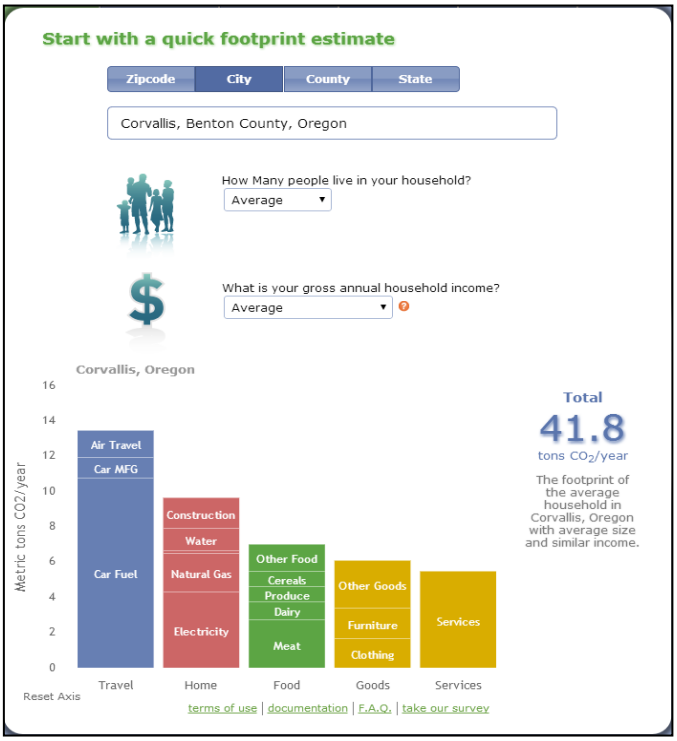
To get a complete picture of the emissions associated with landfilling, it is important to include transport emissions and process emissions, which come from powering the equipment needed to manage the landfill.

Process Emissions Associated with Landfilling						
652 MT CO_2e	**Activity data**		**Emissions factors**			**Method**
	Value	**Unit**	**Value**	**Unit**	**Source**	
Process Emissions Associated with Landfilling	39,760	Wet short tons	0.0164	MT CO_2e / wet short ton	Protocol	SW.5
Method and data source notes: Corvallis community waste tonnage reported in Republic Services 2012 Annual Report.						

The emissions related to solid waste collection and transportation are another source of GHG emissions. Those are already accounted for in the Freight and Service Trucks emissions and were not itemized separately.

Household and Government Supply Chain Emissions

The methodology used to estimate supply chain emissions is based on average emissions factors for various sectors of the U.S. economy. Consumption emissions for an average Corvallis household, at right, were obtained from the *CoolClimate Carbon Footprint Calculator*[6].



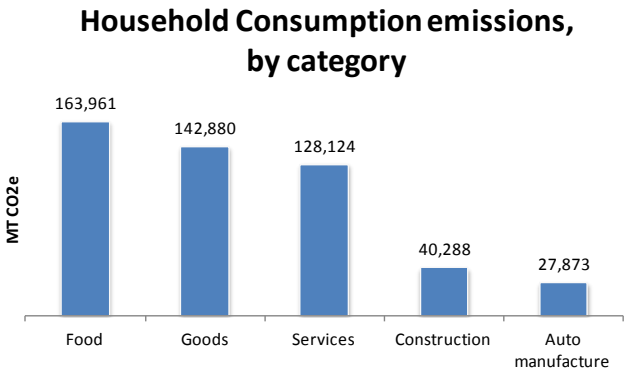
A household carbon footprint can be understood as the greenhouse gas emissions resulting from the production, use and disposal of everything the household consumes in a year, including household energy, transportation, food, goods and services. A household consumption inventory for the entire community is simply the sum of all of the carbon footprints for all households in the community.

Some categories in the calculator were omitted in order to eliminate double counting of emissions. For example, natural gas emissions are already included in Stationary Fuel Combustion. The table below shows which categories were and were not included as Household Consumption emissions sources.

Included in Household Consumption	Not included in Household Consumption
Car manufacturing	Car fuel
Construction	Water
Food	Natural gas
Goods	Electricity
Services	Other fuels
Note: Air travel is included as its own separate category rather than as a part of Household Consumption.	

[6] http://coolclimate.berkeley.edu

When the duplicate categories were eliminated, consumption emissions per household adds up to 21.5 MT CO_2e per year, rather than the 41.8 MT CO_2e generated by the CoolClimate Calculator. This 21.5 MT CO_2e per household was used to calculate the community's total Household Consumption emissions. The chart on the right shows each category's contribution to total Household Consumption.



Emissions estimates for the Government Supply Chain were obtained from the 2008 City of Corvallis Greenhouse Gas Inventory for Municipal Government Operations that used the Local Government Operations Protocol. The City used its purchasing records and the Economic Input-Output Life-Cycle Analysis (EIO-LCA), a public-domain tool developed by Carnegie Mellon University, to estimate the emissions associated with producing the goods and services purchased by the community.

Household and Government Supply Chain Emissions			
507,270 MT CO_2e	**Activity data**		**Method**
	Value	**Unit**	
Household Supply Chain Emissions	21.5	MT CO_2e per household	CoolClimate Carbon Footprint Calculator
Government Supply Chain Emissions	4,144	MT CO_2e	EIO-LCA
Method and data source notes: Household Supply Chain emissions obtained through the CoolClimate Carbon Footprint Calculator. Household unit data from U.S. Census Bureau. Government Supply Chain Emissions calculated for 2008 using EIO-LCA methodology, as reported in the 2008 City of Corvallis Greenhouse Gas Inventory for Municipal Government Operations.			

Conclusion

The goal of this community GHG inventory was to gather and sort greenhouse gas emissions information and present it in a way that is beneficial for future use by the community. The major sources and activities of greenhouse gas emissions have been identified.

This inventory can serve as a source of information for those wishing to pursue climate preparedness activities. It is expected that this will serve as a baseline for additional community greenhouse gas inventories that will be conducted in the future in order to measure change and the impact of any activities undertaken.

Appendix: Community Greenhouse Gas Inventory Details

This table provides a summary of the emissions sources and activities that are included in the community inventory, as well as those potential sources that are excluded.

Emissions Type		Source or Activity?	Included, Required Activities	Included, under reporting frameworks: SI	CA	HC	Other	Excluded (IE, NA, NO, or NE)	Explanatory Notes	Emissions ($MTCO_2e$)
Built Environment										
Use of fuel in residential and commercial stationary combustion equipment		Source AND Activity	X	X					Includes only emissions from natural gas. No data available for other fuels.	172,526
Industrial stationary combustion sources		Source						NO		
Electricity	Power generation in the community	Source						NO		
	Use of electricity by the community	Activity	X	X						341,265
District Heating/ Cooling	District heating/cooling facilities in the community	Source						NO		
	Use of district heating/cooling by the community	Activity						NO		
Industrial process emissions in the community		Source						NO		
Refrigerant leakage in the community		Source						NE		
Transportation and Other Mobile Sources										
On-road Passenger Vehicles	On-road passenger vehicles operating within the community boundary	Source	X	X					Used Oregon DOT's GreenSTEP methodology to calculate VMT.	116,622
	On-road passenger vehicle travel associated with community land uses	Activity						IE		
On-road Freight Vehicles	On-road freight and service vehicles operating within the community boundary	Source		X					Used Oregon DOT's GreenSTEP methodology to calculate VMT.	28,513
	On-road freight and service vehicle travel associated with community land uses	Activity						IE		
On-road transit vehicles operating within the community boundary		Source		X					Calculated emissions using actual transit fuel use.	1,138
Transit Rail	Transit rail vehicles operating within the community boundary	Source						NO		
	Use of transit rail travel by the community	Activity						NE		

Inter-city passenger rail vehicles operating within the community boundary		Source						NO		
Freight rail vehicles operating within the community boundary		Source						NE		
Marine	Marine vessels operating within the community boundary	Source						NO		
	Use of ferries by the community	Activity						NO		
Off-road surface vehicles and other mobile equipment operating within the community boundary		Source						NE		
Use of air travel by the community		Activity				X			CoolClimate calculator	35,603
Solid Waste										
Solid Waste	Operation of solid waste disposal facilities in the community	Source						NO		
	Generation and disposal of solid waste by the community	Activity	X	X						11,924
Water and Wastewater										
Potable Water - Energy Use	Operation of water delivery facilities in the community	Source						IE	Included in Community Electricity use.	
	Use of energy associated with use of potable water by the community	Activity	X					IE	Included in Community Electricity use.	
Use of energy associated with generation of wastewater by the community		Activity	X					IE	Included in Community Electricity use.	
Centralized Wastewater Systems - Process Emissions	Process emissions from operation of wastewater treatment facilities located in the community	Source		X						698
	Process emisisons associated with generation of wastewater by the community	Activity						IE	Wastewater treatment facility located within City limits.	
Use of septic systems in the community		Source AND Activity						NE		
Agriculture										
Domesticated animal production		Source						NO		
Manure decomposition and treatment		Source						NO		
Upstream Impacts of Community-Wide Activities										
Upstream impacts of fuels used in stationary applications by the community		Activity								40,927
Upstream and transmission and distribution (T&D) impacts of purchased electricity used by the community		Activity								629
Upstream impacts of fuels used for transportation in trips associated with the community		Activity								
Upstream impacts of fuels used by water and wastewater facilities for water used and wastewater generated within the community boundary		Activity								
Upstream impacts of select materials (concrete, food, paper, carpets, etc.) used by the whole community		Activity								

Independent Consumption-Based Accounting									
Household Consumption (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all households in the community)	Activity				X			CoolClimate calculator	503,126
Government Consumption (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all governments in the community)	Activity					GC		Emissions data from 2008 organizational greenhouse gas inventory.	4,144
Life cycle emissions of community businesses (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all businesses in the community)	Activity						NE		

Find details on calculation methods and data sources for each included activity and source at the City of Corvallis website www.corvallisoregon.gov/communityGHGinventory.